SCIENTIFIC AMERICAN

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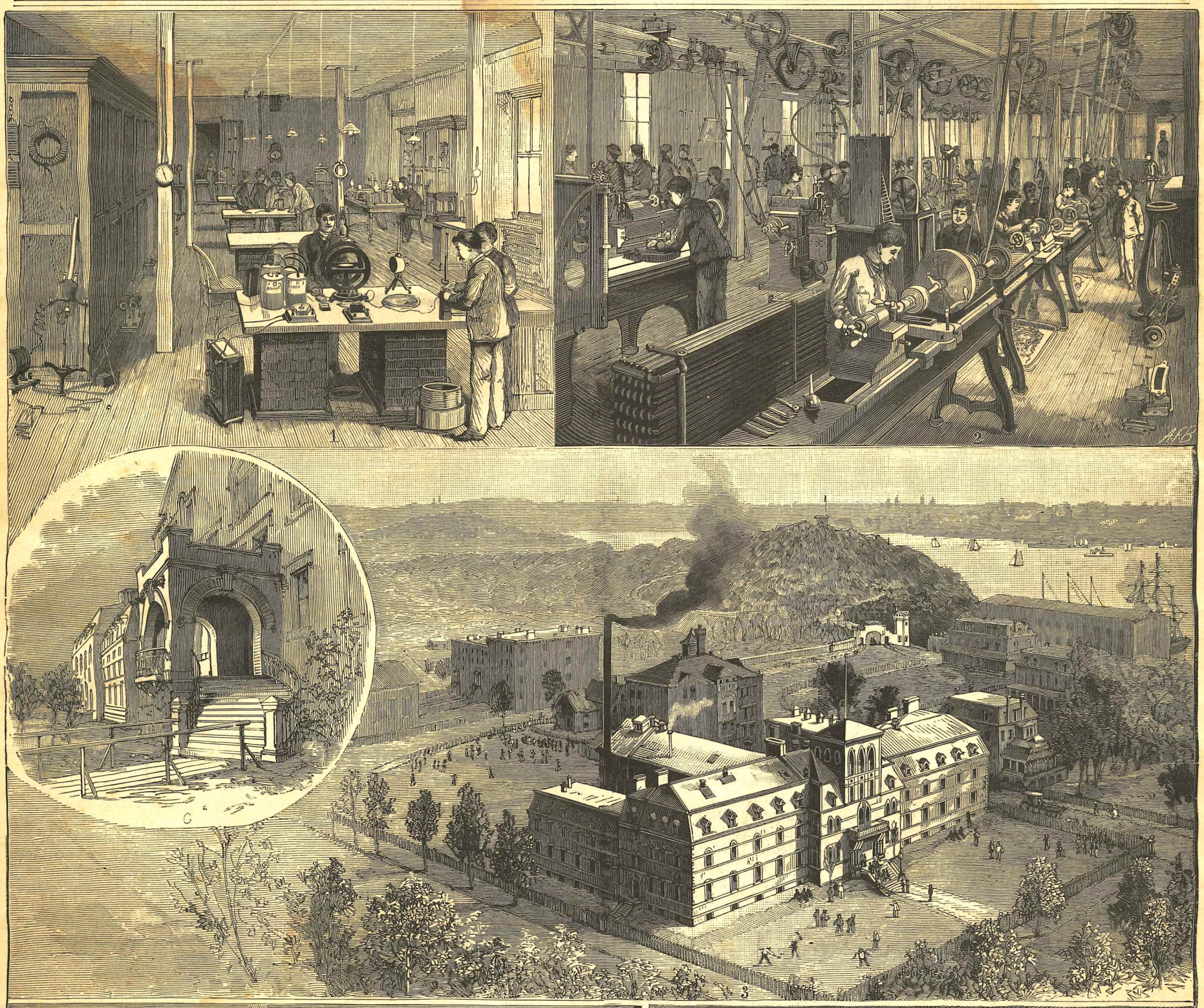

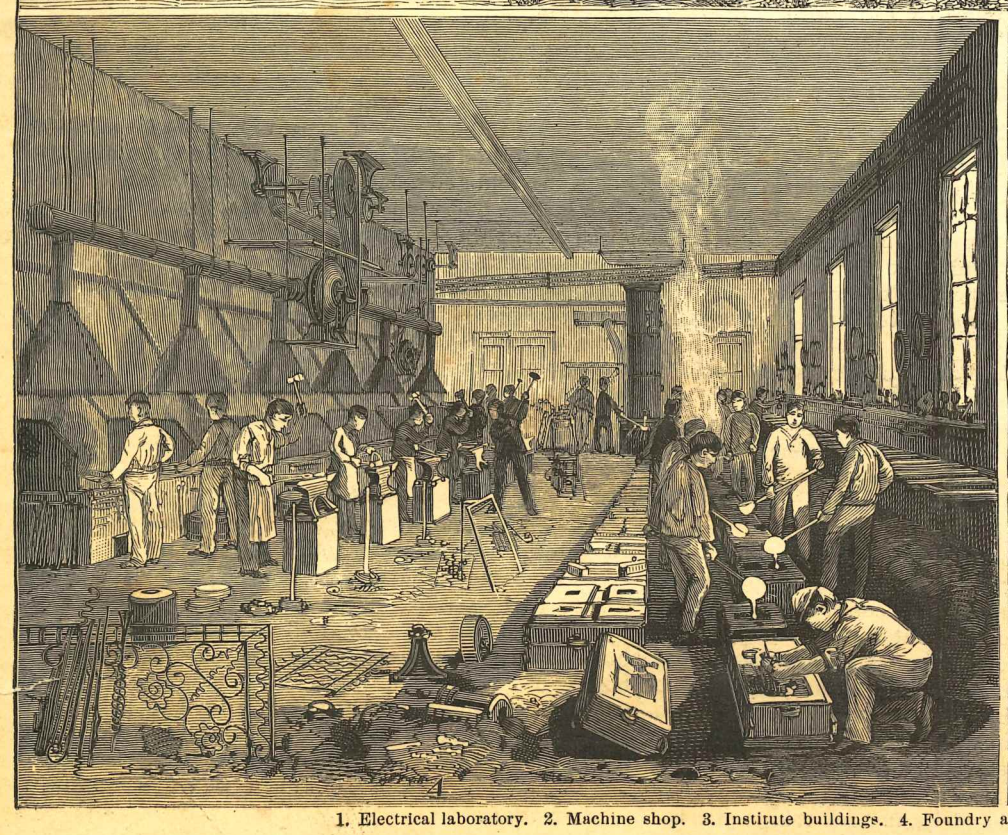

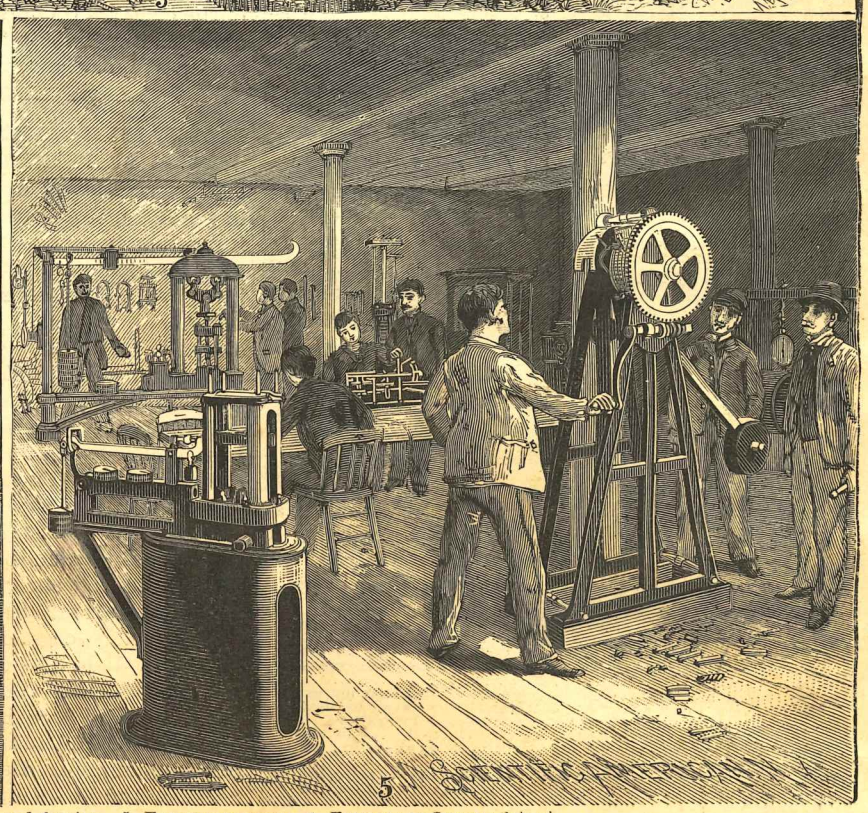

1. Electrical laboratory. 2. Machine shop. 3. Institute buildings. 4. Foundry and forging. 5. Experiment room. 6. Entrance to Stevens School.

THE STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.—(See page 388.)

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THE CRIPPLED CONDITION OF THE PATENT OFFICE.

The pictures given on other pages of this issue tell a story which has been many times presented in the columns of the SCIENTIFIC AMERICAN, but words have been inadequate fully to set forth the details shown in the numerous illustrations. It is a story of governmental neglect of an important department, to call it by its mildest name, and a neglect so obvious, so entirely without excuse, and so detrimental to the inventive skill of the country as to call for universal protest. The inventors have already paid to the government an ample fund, from which better accommodations and enlarged facilities should be provided for the business of the Patent Office. A vigorous protest on account of past inaction and a demand for prompt measures by the present Congress for the relief of the Patent Office should go up to every Senator and every member of the House. Those interested in inventions should not leave it for the press, single-handed, to fight this battle for them. Members of Congress need to feel the effect of direct appeals from their constituents.

CAPE FLOWERS.

It is an interesting fact that the immortelles known as Cape flowers, and which are now used in large quantities by all florists, come from Cape Town in far-off South Africa. The flower is used very generally in the preparation of funeral pieces, its glossy whiteness and the firmness of its petals furnishing just the material which is required. By many people who handle these flowers they are called "capes," and comparatively few are probably aware that they grow wild in large quantities on the South African coast. The plants bearing these flowers grow to a height of from 12 to 16 inches. They are picked by the natives and placed in cones made of paper and kept from the light until dried, when the glossy whiteness, which makes them so desirable for the use of florists, becomes a fixed quality. Some time ago the government authorities came to the conclusion that owing to the peculiar whiteness of these flowers they must be subjected to a chemical process before being exported to this country, and accordingly an investigation was instituted. The late Maria Louisa Pike, who spent many years in Africa, and was entirely familiar with the flora of that country, gave valuable testimony regarding the nature of the plant which bears the immortelle known as Cape flower. It was shown conclusively that the flowers were not subjected to any chemical treatment, but their white, glossy appearance was the result of natural conditions. These flowers grow in great abundance on the table lands back of Table Mountain, Cape of Good Hope, and no reports of them have been obtained from any other locality.

Cape flowers are more generally used by florists than any other of similar character, though the raising of immortelles and their preparation for market is an extensive business. The immortelle plant first became known in Europe about the year 1629, and has been cultivated since 1815. The chief supplies of *Helichrysum orientale* come from Lower Provence, where it is cultivated in large quantities on ground sloping to the Mediterranean, in positions well exposed to the sun, and usually in plots surrounded by dry stone walls. The finest flowers are grown on the slopes of Bandals and Ciotat, where the plants begin to flower in June.

The flowering stems are gathered in June, when the bracts are fully developed and expanded, the immature flowers being pulled off and rejected. After being dried they are sent to Paris in boxes containing 100 bundles, with the flowers placed outward and the stems in the center. Immortelles are also produced in large quantities in Germany. A well managed plantation is productive for eight or ten years.

FRENCH INTERNATIONAL EXHIBITION OF THE PRODUCTS OF FERMENTATION AND DISTILLATION.

It is a striking circumstance that while on this side of the Atlantic associations are formed to oppose and, if possible, to suppress the manufacture of fermented and distilled liquors, and even legislative measures have been taken and sometimes enforced in aid of this movement, we see the opposite tendency on the other side of the Atlantic.

So, for instance, last month an international exhibition was opened in Paris, under the patronage of the government, in the large palace which still stands in the Champ de Mars and was used as a machinery hall during the recent industrial exhibition.

The minister of agriculture is placed at the head of the enterprise, which is advertised as an exhibition of "those large agricultural products about which France glorifies itself," such as those of the grapevine, of sugar, of various grains, etc., consisting of various wines, brandy, cognac, different kinds of alcohols, alcoholic cordials, and other similar liquors, beer, cider, etc. While other countries have promised their cooperation, and some have already exhibited their productions; so Holland exhibits its Dutch gin, so-called Schiedam schnaps, Belgium its famous faro, Germany its lager and its kimmel, Switzerland its kirschwasser, Hungary its zinfandel and its famous tokay, and last but not least, the Rhine provinces their delicious varieties of rieslings, etc.

In addition there are the representatives of various technical schools, special laboratories for research and of educational institutions, as well foreign as French.

The French government, which is specially interested in this industry, from the standpoint of financial revenue, exhibits by documents and apparatus their refined methods to determine the purity of the products, as a protective guarantee for the public health, and the quality, so as to determine the amount of duty to be paid by the manufacturers, while a most interesting feature will be the comparison of the very different methods followed for this purpose in different countries.

But the most interesting part of the exhibition is the retrospective museum, showing to visitors curious objects for comparison between the old and the new methods of manufacture, not only in France but also in other countries, and finally the latest improvements in this line, in which France is acknowledged to stand foremost, with Pasteur at the head.

The Threatened Extinction of the Fur Seal Species.

The Russians, who had explored the northwestern part of the American continent, beginning in 1741, and later appropriated it by right of first discovery, called it Eliaska, Aliaska, or Alaska. They thus obtained a territory of more than half a million square miles, not counting the numerous islands and peninsulas along its extensive coast of 7,860 miles in length—being greater than the Atlantic coast line of the United States, and offering a series of most excellent harbors.

In addition to all this, a smooth inland sea is formed by the numerous islands referred to, while another chain of islands extends from the promontory of Alaska across the Pacific toward the peninsula of Kamchatka in Asiatic Russia; these islands are called the Aleutians. They were first discovered in 1728 by the celebrated Russian navigator Behring, and carefully explored in 1778 by Cook, while shortly afterward (1786) the Russians discovered that another smaller group northwest of the Alaska promontory appeared to be the principal breeding place selected by the fur seals; this group was called the Pribylov Islands.

The Russians had previously done a limited business in the sealskin trade by catching seals where they could find them, skinning them, drying the skins, and selling them in the Chinese market, where they were easily disposed of, as the Chinese do not pluck nor dye them as we do. The discovery of the chief breeding ground gave an enormous stimulus to the business, and soon a rush was made by the Russian trading organizations in Alaska, and more than 100,000 fur seals were caught every year, so that in 1803 several hundred thousand air-dried pelts had accumulated, far beyond the capacity of the Russian companies to find a market for them in time to anticipate their decay.

The reckless seal catching drew the attention of the Russian government, and a decree was issued to forbid seal hunting from 1803 to 1806, for the double purpose to stop the supply, so as not to depress the value of the stock on hand, and to give the seals a r and let them multiply their posterity in peace. However, while thus the Russian and Chinese markets were glutted, the American and English had no supply; and as Russia had forbidden the chase, they concluded to do what the whalers did some years before when the whales were becoming scarce in the north—they went toward the south pole, where there were plenty of whales, and they reported fur seals also.

As the lands around the south pole were claimed by no one, but free, they applied their methods of quick killing of the seals and salting of their skins, which they found to be far more expeditious than the slow Russian method of drying, which resulted in much delay in the cold and moist regions. They began operations in 1806, and were so successful that in 1826, in the space of twenty years, they had succeeded in exterminating all the seals in the southern frozen regions.

At present the same quick method of killing and salting is applied in Alaska, wherefore, if our government, as well as that of England, does not agree to a united action in preventing the indiscriminate slaughter of the fur seals in the north, the same fate is threatening the northern breeding ground as befell that of the south.

Glycerine Jelly.

Take of gelatine, 300 grains; distilled water, 6 ounces; glycerine, 6 ounces; rect. spirit, 6 drachms; white of egg, 6 drachms; salicylic acid, 12 grains. Let the gelatine soak thoroughly in the water, then dissolve in a water bath; add the spirit, and mix well. When cool, but still fluid, add the white of egg, mix, and heat to boiling point to completely coagulate the albumen; add the glycerine with the salicylic acid in it by the aid of heat; mix well and filter, while still hot, through paper previously moistened with distilled water. The whole should be kept in a hot chamber while filtering. —*Martindale.*

When is a Contract by Correspondence Complete?

As a first requisite to the forming of a valid contract, there must be a meeting of minds of the parties thereto. An offer can be revoked before its acceptance, but after the acceptance the offer becomes a promise. The time of acceptance of the offer is the moment of the meeting of minds. It is not a difficult thing to determine this moment in the case of contracts made in the presence of both parties, but the question becomes difficult and very important when the offer and acceptance are made by letter, telegram, messenger, or otherwise. At what moment is the contract consummated? Is it the moment of the posting of the answer, or the receipt of same? Is it the moment the message is started on its way, or the moment it reaches and is communicated to the offerer? In general a communication of an acceptance is necessary to a forming of the contract. Is this essential requisite complied with when the party to whom the offer is made does all he can to deliver his acceptance (whether it ever reaches its destination or not), or must the acceptance have reached its destination before it can have the effect of binding the parties?

It is now decided that the acceptance is made when the acceptor has done all that he can to communicate his intention. The moment, then, of dispatch of acceptance is the moment the contract has its beginning, and once having dispatched the acceptance it is irrevocable. It is understood that one making an offer by letter is making that offer continuously during every instant of the time the letter is traveling, so that if the letter is delayed in transit, and on its receipt a letter is at once posted accepting the offer, the contract is complete, even though in the meantime the party offering may have sold the goods which were the basis of the offer. Suppose the letter of acceptance be lost and does not reach the party offering. Is there a contract? The logical result of the position that the contract is made when the acceptance is posted leads us to infer that the question demands an affirmative answer, and such is the law. The settled rule in our courts is that the time of mailing the acceptance is the time the contract is complete, and that the subsequent fate of the letter is immaterial. This is so on the theory that the post office is the agent of the person who makes an offer by post, and the delivery of the letter to the post is the delivery to the agent of the person making the offer.

Suppose that a letter revoking the proposal is mailed before the acceptance is mailed, this does not affect the result unless the revocation is received before the acceptance is mailed. One in making a proposal may state it as a condition to the making of the contract that the notice of the acceptance be received in order to be binding.—*Wm. C. Sprague, in The Age of Steel.*

Gold and Silver from Sea Water.

The presence of silver and gold in sea water has long been known, but no economical method has ever been invented for extracting them. The investigations of Mr. C. A. Munster, described in the *Norsk Tekniak Tiddskrift*, and his proposed method of dealing with the matter will be of interest: Sea water was taken from Kristiania Fjord, and 100 liters were evaporated to dryness, giving 1,830 grms. of residue. This was ground and divided into portions of 300 grms., each of which was mixed with 100 grms. of litharge, 100 grms. of pure $KNaCO_3$, and 4 grms. of carbon from starch, and the silver and gold determined. The result was: 19 mgrms. silver and 6 mgrms. gold per ton of average sea water. By check experiment this result was modified to a final result, the effect of which was that one ton of average sea water contains 20 mgrms. of silver and 5 mgrms. of gold per ton, worth respectively 0·06 and 0·38 of a cent.

Considering the extremely small amounts of precious metals present, the author considers that no method of precipitation in tanks can possibly be successful. He thinks that the precipitation must be effected in the sea itself, where the water is continuously renewed by a natural current. He proposes that a channel about 60 meters wide between two small islands, well sheltered from sea or wind, where there is a current of about 4 meters per minute, should be selected for the experiment, such rocky islets being common off the Norwegian coast; across this channel 60 plates of galvanized iron, each 2 meters × 3 meters, should be arranged at an angle of 30° to the stream, and an electric current be sent through the series to precipitate the precious metals. The power required theoretically for this purpose he calculates at only one-half horse power, and he thinks that to produce a current of such trivial potential difference in practice would only require a few horse power, which could cheaply be obtained from water power, wind, or even by the thermo-electric principle, utilizing the difference of temperature between the sea and the air. The large anodes required could be cheaply prepared from wood, impregnated with graphite and tar, and carbonized, high conductive power not being required for such a feeble current. If all the precious metals passing these plates were precipitated, he calculates that over $1,500,000 would be obtained per annum, and as the working expenses would be most trivial, if only $\frac{1}{100}$ or even $\frac{1}{1000}$ of this amount were obtained, it would still pay well. He therefore thinks the experiment well worth a trial.

Boston's Tribute to Columbus.

There is a bit of sarcasm in the words of the old Spanish chronicler Herrera, when, at the close of a long eulogy of Columbus, he says, "Had he lived in ancient times, statues and temples would have been erected to him without number, and his name would have been inscribed among the stars." For, since the coming of Christ, no greater event has transpired in the world's history than that with which the name of Columbus is inseparably associated. And yet, as a matter of fact, until comparatively recent times, no statues or temples have been raised to his memory. Genoa built him a monument in 1862, and Barcelona another in 1888, while quite recently was unveiled at Madrid a handsome memorial in his honor. In the New World, Mexico, Nassau, New Providence, Lima, Cardena and Santo Domingo, all have Columbus monuments, and New York and Chicago will build enduring memorials during the present year. But among them all, none is of greater importance, more appropriate in design or grander in the event to be specially commemorated than the monument about to be erected this year at Old Isabella by the Boston Columbus Memorial Committee. This monument is Boston's tribute to the great discoverer and is a veritable work of art. It is taken largely from designs drawn by Richard Andrew, a young student of rare promise at the State Normal Art School, Boston. Much credit is also due Professor George Jepson of the same school, under whose supervision the work has been done and who has taken an active interest in the enterprise from the start. The sculptor is Alois Buyens, of Ghent, a distinguished artist, whose name is well known throughout France and Belgium for works of art of a high order of excellence. After winning the highest honors at the Academies of Ghent, Liege, and Brussels he went to Paris, where he spent several years at the Ecole des Beaux-Arts. His latest work, and one which has attracted much attention in Europe, is a colossal statue in bronze of President Brand, of the Orange River Free State, the Washington of the South African republic. About a year ago Mr. Buyens came to this country, and though now commissioned upon a work which will attract universal attention, he is extremely unassuming as to his art. Competent critics who have seen his work pronounce it far above the average.

The monument will be erected on the island of Santo Domingo, where Columbus planted his first settlement and on the spot where he built the first church from which the Christian religion took its rise in the New World. Two events, therefore, are to be commemorated by it—the establishment of Christianity and the rise of civilization in the Western Hemisphere. Two fine bass-reliefs, one on either side of the base, set forth these facts, in a figurative way—the ideal groupings representing the genius of Christianity and the genius of civilization respectively. The former is a female figure representing Mother Church fostering a little Indian child and pointing to a suspended cross in the distance, the emblem of man's salvation. The latter is an ideal figure, perhaps the goddess Ceres, drawn in a chariot by prancing horses; her arms are filled to overflowing with gifts and flowers, she is bringing the gifts of civilization, and Columbus, at the horses' heads, is pointing the way for her to follow. It is a beautiful grouping, artistic and noble in conception and well symbolizing the rise and progress of civilization, first planted there by Columbus. A third tablet carries the inscription in terse rhythmical Latin sentences, from the pen of Mgr. Schroeder, and interprets the meaning of the monument very closely. It follows the Roman lapidary style, all the letters being capitals, the U's like V's and the J's like I's, with a period after every word except the last of each line, and runs as follows:

ANNO. CLAUDENTE. SAECULUM. XV
EX. QUO. COLONI. CHRISTIANI. COLUMBO. DUCE
HIC. POST. OPPIDUM. CONSTITUTUM
PRIMUM. IN. MUNDO. NOVO. TEMPLUM
CHRISTO. DEO. DICARUNT
CIVES. BOSTONIÆ. SUB. AUSPICE
EPHEMERIS. BOSTONIENSIS
CUI. A. SACRO. CORDE. EST. NOMEN
NE. REI. TANTÆ. MEMORIA. UNQUAM. DELABATUR
HAEC. MARMORI. COMMENDAVIT
A. D. MDCCCLXXXXII

Thus, so long as the bronze endures will the world know that the citizens of Boston have built this monument to Columbus, that the spot where Christian civilization took its first rise in the New World might not be forgotten.

The statue itself is of colossal size and represents Columbus in an attitude of giving thanks to God, and pointing to the site of the first settlement on the globe at his feet. It is both confident and easy in pose. The face has the look of one inspired, while the outstretched arm gives an appearance of movement and grateful gladness to the entire figure. As the picture shows, the statue will be mounted on a pedestal ten feet high, which stands on an elevated knoll, the site of the ancient town, about eight miles in from Cape Isabella, overlooking the sea. The situation is very picturesque, according to Mr. Frederick Ober, who has recently visited it in the interests of the World's Fair. Upon a rock ten to twenty feet in height facing the west, he writes, with a splendid beach to the north, there extends in a gradual ascent toward the mountains a beautiful plain of 500 or 600 feet in width, rising suddenly from the beach. This was the site of Old Isabella. On this beach, Columbus landed with the cavaliers whom he had brought for his first colony in the New World. Here they encamped while they proceeded to build the town, and history says they built a fort, a church, a king's storehouse and a residence for Columbus, all of hewn stone, the ruins of which existed up to a short time ago.

It is the purpose of the Monument Committee to build the pedestal from these ruins, thus incorporating into the very walls of the memorial an enduring memento of the early Spanish conquerors. The Dominican government has granted the site of the town to the committee and the United States consul at Puerto Plata has recently visited Isabella in the interest of the enterprise. He has made clearings and succeeded in locating exactly the site of the ancient church, and preparations will be made at once to begin the foundation.

The plaster cast of the monument, now on exhibition at the Museum of Fine Arts, Copley Square, Boston, will be taken to Chicopee, in a few days, for casting in bronze. It is expected that the committee will be ready to sail about the middle of July or August, and Boston will thus have the honor of inaugurating the Columbus celebrations in 1892. Among those who have contributed and constitute the committee are Most Rev. John J. Williams, Rev. John O'Brien, Captain Nathan Appleton, Dr. Chas. H. Hall, Hon. A. Shuman, Gen. Chas. H. Taylor, Hon. Chas. F. Donnelly, Hon. W. E. Curtis, Hon. S. M. Allen, Thomas B. Noonan, Esq., Hon. Stephen O'Meara, Hon. Thomas N. Hart, W. R. Richards, Esq., and many others, clergymen and prominent gentlemen of Boston and vicinity.

No monument in the world commemorates an event so fruitful of good and so pregnant with blessings to mankind as does this proposed monument of Columbus at Old Isabella. It marks a distinct epoch in the progress of humanity. The landing of the Pilgrims, the Declaration of Independence, the founding of the Constitution, were all events of the greatest importance, but were made possible only by the still greater achievement of the discovery and civilization of America, which Columbus so heroically began. And this perhaps is the best of all monuments to his memory. For, grander than sculptured marble or engraved stone and more lasting than tablet of bronze or granite is his memorial in the hearts of the millions of people in the New World to whom he has given a refuge and a home.—*T. H. Cummings, Amer. Architect.*

The New York Black Knot Law.

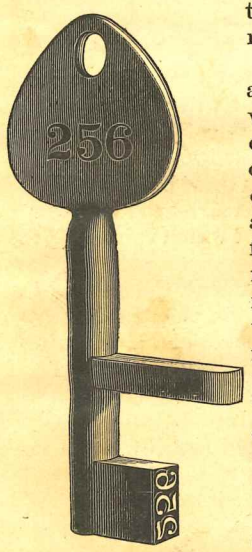
The law concerning the black knot of plum and cherry trees, which was recently passed by the legislature of New York, and which is now in force, declares a tree infected by this disease to be a nuisance, and requires the owner of such tree or trees to abate the nuisance. It authorizes the supervisor of any town (or the mayor in the case of a city) to appoint, on the application of three or more resident freeholders of the town, three commissioners who shall be fruit growers and residents of the town. It shall be the duty of these commissioners to examine any tree or trees known to be or suspected of being affected by the disease in their town, and to mark for destruction the part or parts found to be infected by the black knot. If the tree is so badly affected that its total destruction is demanded or necessary, they are to mark it by girdling its trunk. They must then give notice to the owner, who is required within ten days of such notice to cut away and burn the part or parts marked, and in case of the girdled tree to destroy it wholly, burning the affected parts. If he fail to do this within the specified time, the commissioners are to do it for him, and he renders himself liable to a fine not exceeding $25 or to imprisonment not exceeding ten days, or to both, in the discretion of the court. Any justice of peace in the town has jurisdiction in the case. The commissioners are to receive each $2 a day for the time actually spent in the discharge of their duties and their necessary expenses. The owner of destroyed trees is debarred from recovering damages against any one destroying the infected trees or parts thereof.

With this law faithfully enforced, the fruit growers of New York may expect to be free from a fungous foe that has inflicted upon them untold losses in the past. —*Country Gentleman.*

OWING to the fact that counterfeit coins are bad conductors, Professor Elihu Thomson suggests the electric current as a means of detecting spurious money.

AN ACCURATE AUTOMATIC TIME RECORDER.

The illustration represents an improved time-recording mechanism, operated in connection with a standard clock, which gives in permanent printed form the hour and minute at which persons arrive and depart in the morning, at meal time, or at any time of the day or night. It is designed for use in factories, shops, stores, offices, or wherever the time of the employes is required to be noted.



KEY OF TIME RECORDER.

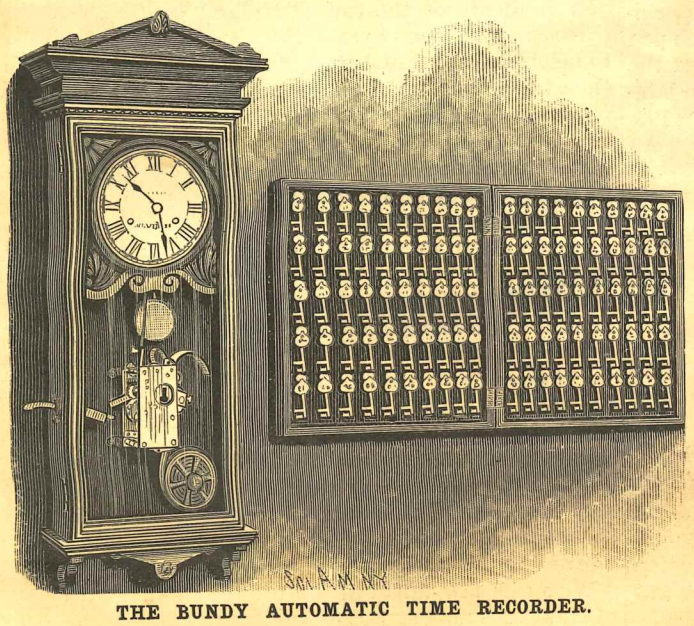
The recording mechanism is arranged in a suitable casing within the clock case, below the dial and behind the glass panel of the door, so that the works can be plainly seen, there being a central opening in the glass in front of the recording mechanism for the admission of the registering key. The clock works are of the best variety made, being the Seth Thomas 100 beat pendulum movement. The ink ribbon is within the casing with the mechanism, and the paper reel is just below it to the right.

To the right of the clock, as shown in the main view, is an open case or keyboard fixed against the wall, in which are hung numbered keys, such as shown in full size in the accompanying cut. Each workman or employe whose time is to be taken is given a number, and when he goes to work he takes his key from the keyboard, inserts it in the keyhole of the recorder, turns it one-quarter around, and then removes and hangs it up again, before passing on to his work. By this movement of the key he has recorded upon the paper ribbon within the machine the number of his key and the exact hour and minute of his arrival. If he is going out instead of coming in, he holds down the lever projecting through the clock case on the lefthand side, and a star is then printed in front of the hour on the paper strip, as shown in some of the instances given in the accompanying illustration. According to the record shown, it appears that No. 21 arrived between 47 and 48 minutes after 6 o'clock; No. 75 at 6:53; No. 28 at 6:56; No. 56 going out at 10:30, and No. 97 going out at 12:3, etc. The paper strip can be readily removed for filing away as often as desired, thus forming a perfect and indisputable record of the workman's time. A bell rings as each record is made, thus preventing one man from registering for another without the act being detected, and after the key is once inserted it cannot be taken out until it registers, neither can a second registry be made without removing the key.

VI 48/47 21
VI 53/52 75
VI 57/56 28
VII 2/1 4
★X 30/29 56
★XII 3/2 18
★XII 4/3 97
★XII 56/55 51
XII 57/56 35
XII 58/57 45
XII 59/58 43
★V 2/1 62
★VI 4/3 84
★VI 8/7 96

RECORD STRIP—TIME RECORDER.

This time recorder is manufactured by the Bundy Manufacturing Co., of Binghamton, N. Y., and more than a thousand of them are now in daily use in various manufacturing industries and mercantile establishments. In one instance the time of over 1,400 employes is thus kept, five of the recorders being used for this purpose, and in several establishments employing over 1,000 hands the time is thus kept, the instruments in every case giving entire satisfaction.



THE BUNDY AUTOMATIC TIME RECORDER.

Sea Shore Sands.

The sand of which the bulk of the masses of sea beaches is composed is vastly more durable than the seemingly more resisting pebbles. Pebbles wear out rapidly. Scarcely any, even the hardest, can stand a year of steady thrashing on the shore, but these sands endure for ages. The reasons for this are simple. In the first place, each grain of sand is an admirable illustration of the principle of the survival of the fittest. If it be not perfectly coherent and very hard, it will not be carried far before its weakness is found out and it is broken into mud on the pebble beaches, where it is generally made and borne away by the sea to the deeper water. Then, because of their smallness, the grains lie with so little interspaces between them that they hold the water next their faces by capillary attraction. When a wave strikes the shore the grains of sand are pounded together, but they do not touch each other. If we press on the wet sand with the foot we see that the mass whitens as the pressure is applied, and a part of the interstitial water is poured out; take the foot away, and the water returns to the crevices between the grains. Only dry sand will rub grain against grain and give the audible sound which, when it is sharp and clear, is called singing. No beach will thus creak or sing beneath the foot when it is wet.

This curious endurance of rocky matter, in its comminuted form, of the erosive force of the sea makes the sand the natural protector of the land against the fierce assaults of the sea. If sand were easily pulverized, if it were readily floated away, if it had, indeed, any other than its actual assemblage of properties, it is doubtful if the lands could have made good their place in the contest with the ocean. These doughty little champions have certainly kept for our use empires which, but for their good work, would long ago have vanished beneath the waves.—*Prof. Shaler, Scribner's Magazine.*

The Telephone System in Belgium.

In the early days of the telephone its working in Belgium was entirely in the hands of private companies, but excessive competition among them, and the uncertain character of the concessions granted by the state, retarded its development. It was not until 1883 that the State Department of Post and Telegraphs took the matter seriously in hand, and obtained a law authorizing the government to undertake themselves, or to concede (under fixed conditions) to others, the establishment and working of lines. Thereafter, the Bell Telephone Company bought up the interests of the existing rival companies in Brussels, and secured concessions for the other large towns. Other companies have since obtained concessions in various parts of the country. The charges compare very favorably with those in force in this country. In Brussels and Antwerp $50 a year is the ordinary charge, and this is the highest rate current in Belgium. In Louvain, Courtrai, and Maline, only $25 a year is charged, and on the state lines open the rates vary from $30 to about $40 a year. This includes the free transmission of telegrams, home and foreign, over the wires, a privilege which is much valued. In 1890, nearly 800,000 telegrams were thus telephonically transmitted.

AN IMPROVED ORE SAMPLING DEVICE.

The illustration represents an ore sampler arranged to produce two samples of ore which shall be alike, one serving as a duplicate or check to prove the accuracy of the work performed. The improvement has been patented by Mr. R. C. Hawley, of Pueblo, Col. The ore to be sampled is supplied through a hopper, in which is a rotary screen, or it may be supplied direct from a crushing machine. Below the hopper is mounted a swinging wing, so that the ore passing down is divided and passes in equal parts into branch hoppers, the latter discharging into the upper end of a casing divided by a partition into two compartments, as shown in the sectional view. The casing is set on a base containing an outlet into which the lower ends of the central compartments discharge, the bulk of the ore passing through this outlet by a door to one side, while in the base are two compartments receiving the samples from either side. Four sets of oscillating wings, as shown, are arranged below the respective hoppers, each dividing the ore into two equal parts, so that the portion finally passing through the outer channels into the sampling compartments will be both alike in quantity and quality.

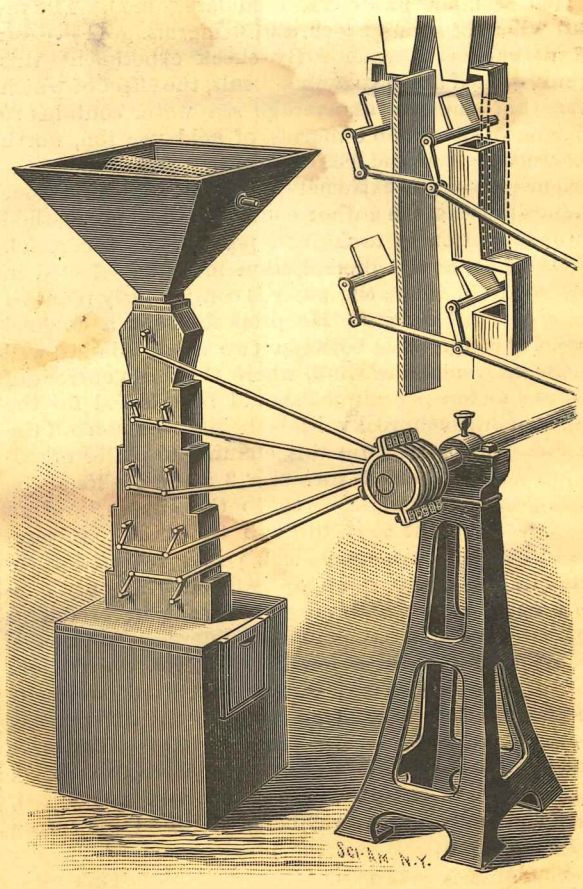
The several shafts of the oscillating wings have arms on their outer ends connected with each other by links, and also connected by rods with eccentrics on a common shaft, by which the wings are oscillated to cross the stream of ore, preferably about a hundred and fifty times a minute, thus insuring an accurate division of the dust as well as the coarser particles of the ore, the travel of the wings being so short that no draught of air is formed.

ATTACHMENTS FOR SWIMMERS' USE.

The illustration represents the use of readily applied attachments, fitting the upper and lower limbs of a swimmer, and designed to facilitate the rapid propelling of the body through the water when the legs and arms are moved in the usual manner. The improvement forms the subject of two patents issued to Mr. Patrick Curran, of Hoquiam, Washington. A wristband and bands encircling the hand, but leaving the thumb free, afford support for a plate to which is hinged a paddle-blade of thin sheet metal, as shown in Fig. 3, the hinged connection being such as to allow the joints to flex and the blades to fold inwardly toward the palms when the arms and hands are retracted after the stroke. In making the stroke the blades rock outwardly and lie in planes coincident with the flat sides of the extended hands. Equivalents for the hand attachments are furnished for the lower limbs, two fans being applied on each leg, one inside and one outside of each foot, a little above the ankle, reaching well down on the foot when feathered and almost forming a circle when extended. The fans are attached to the legs, as shown in Fig. 2, by means of one piece of canvas buckling in front with three buckles, two below and one above the hinges, and a strap passing across under the foot and fastened to the canvas on both sides. To compensate for the weight of the attachments and to give buoyancy to the body, a life preserver belt may be worn around the breast, or float attachments, may, if preferred, be secured near each elbow and on each shoulder. The entire equipment is designed to reduce fatigue and conduce to safety, while greatly increasing the speed with which a swimmer can propel himself through the water.

CURRAN'S SWIMMING EQUIPMENT.

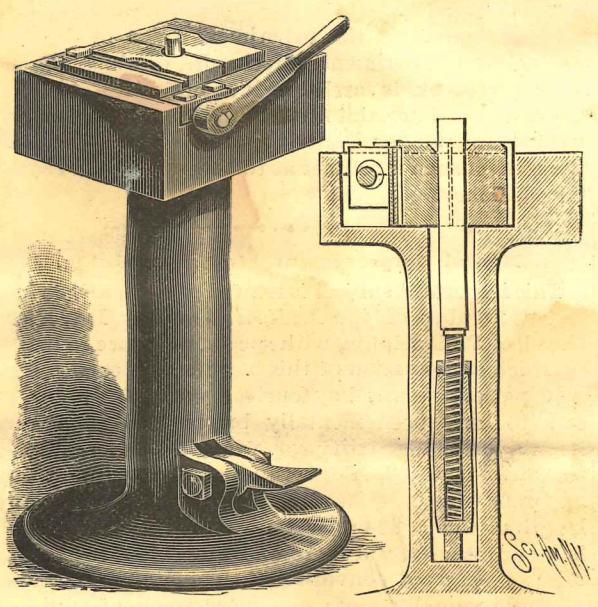
DEAD BLACK.—To 2 grains of lampblack add 2 drops of gold size and thoroughly mix. Then add 24 drops of spirits of turpentine and mix. Apply with a thin camel hair brush.



HAWLEY'S ORE SAMPLING DEVICE.

AN IMPROVED BOLT HEADING MACHINE.

The needs of blacksmiths and carriage-smiths have been especially considered in the construction of the simple and durable bolt-heading machine shown in the accompanying illustration, although it is equally applicable for any service where it is desired to head bolts rapidly and nicely. It has been patented by Mr. William H. Betts, of No. 134 Dykeman Street, Brooklyn, N. Y. A box at the upper end of the hollow column, as seen in the sectional view, contains the bolt-holding dies, preferably of steel, and having on opposite sides grooves terminating at one end in a square shoulder and at the opposite end in recesses, so that they are adapted to form either a flat head or a



BETTS' BOLT HEADING MACHINE.

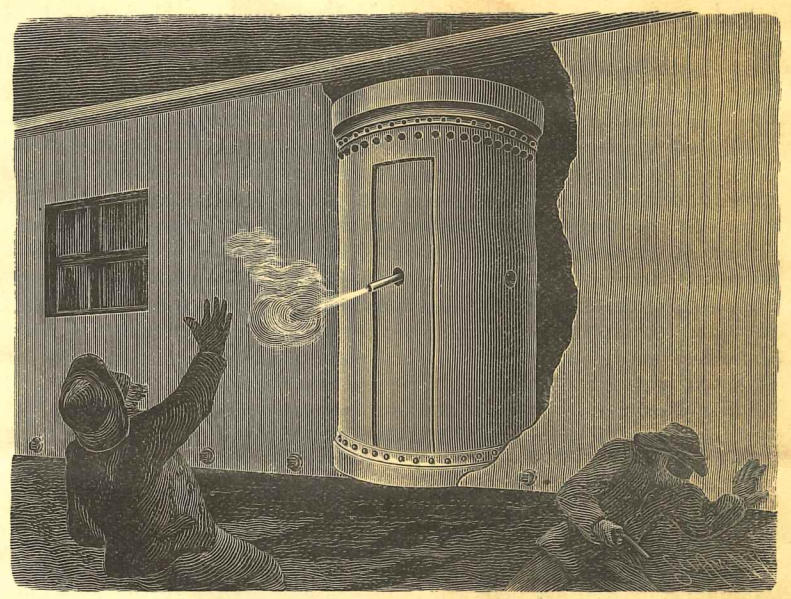
head to fit a countersunk hole. These dies serve as an anvil, and when the bolt projecting through them has its head formed, the end of the bolt is hammered down upon the upper faces of the dies. The bolt extends down and rests upon the head of an ejecting plunger, adjustable to fit bolts of different lengths, the lower end of the plunger resting upon the inner end of a treadle lever. Within the box, at one side of the dies, is a binding block mounted on a cam shaft having a hand lever, by which the shaft may be turned to force the block against the dies to hold them firmly in place. The treadle mechanism is necessary, as the bolt when inserted hot between the dies is inclined to stick.

Tin Salt in Gingerbread.

The attention of the Minister of the Interior has recently been called to the considerable amount of protochloride of tin now used by manufacturers in making gingerbread, the consumption of which in France is considerable. It appears that by the use of this chemical common meal and other ingredients may be used, while the gingerbread will still have the appearance of being of excellent quality. This adulteration has only been going on for some twelve months, but has rapidly developed. The proportion of protochloride of tin used is by no means insignificant. It varies from 500 grammes to 5 kilos. of tin salt to 100 kilos. of flour, producing 200 kilos. of gingerbread. Experiments have shown the chemical in question to be very poisonous. At the last meeting of the Council of Public Hygiene M. A. Riche presented a report of analyses made at the Paris Municipal Laboratory, the most adulterated sample of the bread in question containing 1 per cent of tin. Even if the addition of tin were innocuous, he said he would strongly recommend its prohibition, because it allowed inferior substances to be used in preparing an article of food which is principally consumed by children. M. Riche drew attention to a case of poisoning near Rouen, reported by Dr. Guersant. A servant had carelessly put some chloride of tin in soup instead of ordinary salt. The disagreeable taste prevented some of the family from eating the soup, but those who took only a small quantity showed distinct evidence of poisoning.

A REVOLVING SHIELD FOR CARS.

A metallic turret or shield designed for use in banks, express cars, or any other place liable to attack by robbers or highwaymen, is shown in the accompanying illustration, and has been patented by Mr. John E. Shanafelt, of Lawrence, Kansas. The turret is closed at the top and bottom, and has a door which slides in horizontal ways on its interior. The door and the sides of the turret have sight holes through which a person inside may fire upon an approaching enemy, the sight holes each having vertically sliding blinds which can be opened or closed at will. The top of the turret has a central ventilating draught opening, in which is a tubular journal projecting through the car roof, facilitating the revolving of the turret, which is pivoted centrally upon a stud or pin at the bottom. The mechanism for revolving the turret consists of a gear wheel, with an operating handle, meshing with a toothed wheel, both wheels being mounted upon a framework within the turret, and the toothed wheel extending through a slot in the turret bottom, where it engages a circular rack bar in the floor of the car or room where the turret is set up. Caster rollers may, if desired, be attached to the bottom of the turret as an additional support and to facilitate its turning, or the shield may be built in the corner of a room, to be stationary, and of such shape as may be best fitted for different situations. The construction occupies no more space than an ordinary heating stove, is comparatively inexpensive, and is designed to be readily accessible to an express messenger or other person in charge of valuables in time of danger.



SHANAFELT'S REVOLVING SHIELD FOR CARS.

THE FAMINE IN INDIA.

FRANK VAN ALLEN, MEDICAL MISSIONARY TO MADURA, SOUTH INDIA.

The attention of the whole world is directed to the terrible famine in Russia, consequently it is not generally known that a similar scourge is afflicting India. In this country all the horrors which follow in the wake of starvation occur with fearful regularity every fifteen years, or twice in every generation. The last great famine was in 1876, and it was estimated by the government that 5,000,000 (five million) persons died of starvation and the two diseases that go with it—dysentery and famine fever.

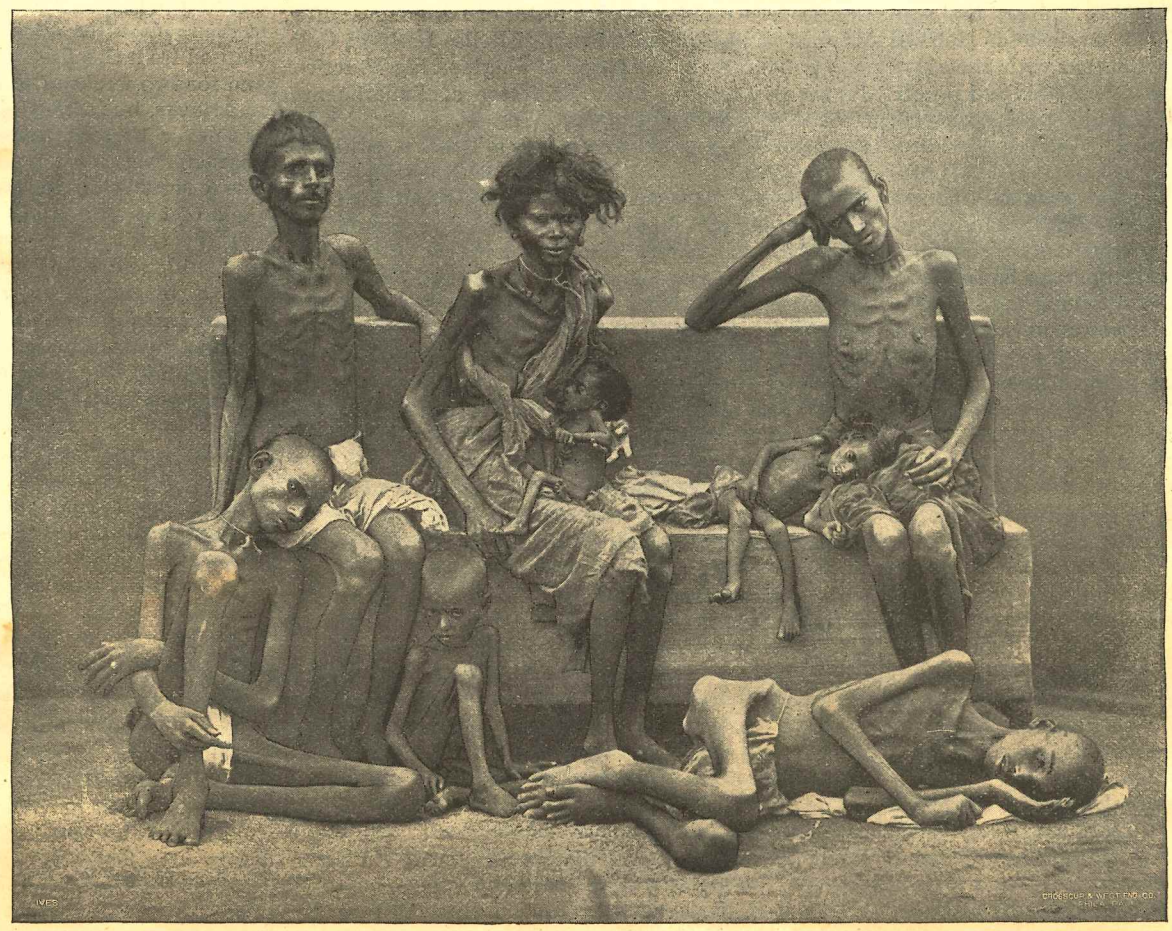
The cycle is completed again. Owing to a partial failure of rains, the fearful calamity of another famine was threatened a year ago. This year the rains have entirely failed; however, the famine is not yet at its height, for there are districts here and there where a slender harvest is possible, which for a few weeks will ameliorate the condition of the people who live in these favored parts. When this small supply of grain is exhausted, the famine, which is already very serious, will grip the whole nation in its withering hand, and there is no hope or help from within their borders until the next rains, nearly a year hence.

No one who has not seen and felt the awful desolation can realize into what a fearful condition a country is plunged by famine. No rain, crops scorched by the intense heat; tanks, whose supply of water has been depended upon for irrigation, empty, and their beds baking in the blazing sun; all vegetation withered, and rivers and wells dry; the scarcity of food increasing, the price of grains rapidly rising; the people, with their gaunt, emaciated bodies, flocking by the hundreds and thousands to the relief camps established by the British government. All this misery and suffering because the blessed rain has been withheld. In many places fodder for cattle is unattainable, and the people are tearing thatches from buildings to feed the famishing animals. In other localities cattle are being killed in great numbers, as their owners are unable to feed them. Also thousands and thousands have died and are dying of starvation. Every effort is made to keep a certain number alive, which must be done at all hazards, for plowing when the next seeding time comes.

How the people are to maintain themselves until the next annual rains is a most serious question, and will doubtless be answered in the usual way—a large part of the population will be supported by the government at the famine camps. There will be a bare existence of many others, and the death of thousands and even millions of people. The better class will have enough to eat, as they will import grain at enormous prices from other countries.

But the matter of food is not the only problem connected with existence. The question of water becomes a pressing one, and is more serious from the wretched religious caste customs; a high-caste man will not drink from a well if a low-caste man has lowered his water pail into it, and so defiled its contents. This really affects the low-caste man, because he is driven away and not allowed to come near these wells, and his own being more shallow have become dry. In this emergency the government comes forward, and as a part of the relief work offers to loan money for the digging of wells. The people avail themselves of this offer, and just now there are being dug in one presidency upward of 19,000 (nineteen thousand) wells from loans so made by government. This money is loaned on thirty years' time, with interest at three per cent per annum, and often without sufficient security, but is done to relieve the distress of this ill-fated nation.

With all that the English government are doing to alleviate the horrors of the famine, there is much unnecessary suffering, which arises from the peculiarities of the people, particularly the higher castes. For a caste man to eat or drink anything which has been touched by one not of his caste is so degrading that he would rather suffer death. This is a religious matter with him, and there



THE FAMINE IN INDIA—REFUGEES IN A GOVERNMENT CAMP.

is no doubt but multitudes die because they will not accept food at government relief camps or famine kitchens. Many others of not so high caste hold out for a while, then come and partake of the wholesome food. This is too much for their weakened condition, their stomachs refuse to digest it, dysentery results, and in a few days they die.

The one disease accompanying a famine and causing more deaths than either dysentery or actual starvation is famine fever. It is a late attendant, appearing when the people are emaciated and weak, and for it there is no remedy, and the other remedies have no effect on it. When once begun, it becomes widespread. The weak and ill-nourished who have resisted other influences, and but for this might have lived until the next rains, fall easy victims. It is during this period that deaths are so numerous. The dead lie by the roadside in great numbers; the dying crawl off into the jungles and are eaten by wild animals.

All that a government could do for a famine-stricken country, the English government does for India at these sore times, and deserves much praise for the energetic measures taken. Leave on furlough to all officers of government is forbidden. Those absent on leave are summoned; relief works are begun. These consist of building new roads, canals, etc., and are designed to help those who are able to work. During a famine many such public improvements are constructed which the government would not otherwise afford. For those who are not able to work by reason of their reduced strength, debility, or age, a form of relief is established known as the famine kitchens. There meals are cooked and given away to all who come. For those who are unable to walk, camps are provided; they are generally located near a kitchen, and are a refuge for thousands. These relief works, famine camps and kitchens are to be found every few miles all over India while a famine lasts. But although the government deals thus energetically with the problem, and grants every alleviation in its power for the distressed country, the suffering and loss of life is extreme.

STEVENS INSTITUTE OF TECHNOLOGY.

If any one should turn back to the volumes of the SCIENTIFIC AMERICAN, between 1871 and 1873, they would find various notices of the Stevens Institute of Technology, then being established in Hoboken, N. J., in which we took a lively interest as being the first institution devoted exclusively to the training of mechanical engineers in this country, and we may indeed say in the world, if we take account of the special combination of theory and practice involved in its course of instruction; because in no school before had there been any such combination of the theoretical development of the science of mechanical engineering on a mathematical basis with the practice of the same science as carried out in the foundries and workshops.

We naturally looked upon the experiment then and there inaugurated with the deepest interest and most cordial sympathy, because we saw how important to the prosperity of those mechanical industries on which our national prosperity rests would be the success of this undertaking, which aimed at nothing less than the education of young men in a way that would fit them to go into the workshops of the country and supply the much needed theoretical knowledge derived from the recorded experience of others with the aid of the potent tools of mathematical methods and practical familiarity with the machines and processes to be handled.

The two factors supplied for the solution of this problem were: A bequest of money and ground, amounting in all to about $750,000, made by Mr. Edwin A. Stevens, and a faculty of young and energetic professors, headed by President Henry Morton, who had already distinguished themselves in their various departments.

It is now 21 years since this experiment was begun, and as we look at its results to-day we see our brightest anticipations and most sanguine hopes more than realized.

Graduates of the Stevens Institute are filling positions of the greatest responsibility in the workshops and great industrial enterprises of the country, and are in demand beyond the capacity of the Institute to supply them, and, on the other hand, applicants for admission have for several years so much exceeded the capacity of the Institute to accommodate them that considerable numbers have been refused admission, not for lack of adequate preparation (though the scholastic standard has been constantly raised), but because there was absolutely no room to hold them.

When we compare the means available with the work done, we are astonished at the result from a financial standpoint.

It must be remembered that never in the history of the world has an institution of the higher education, and especially one for industrial training, where extensive workshops and laboratories have to be provided and kept running, been self-supporting. In all cases, large subsidies from governments or large endowments from private individuals have been required to support such establishments, and that the Stevens Institute should have reached its present dimensions and completeness, with a building fund of but $150,000 and an annual income derived from less than $500,000 endowment fund, is simply marvelous in the eyes of any one familiar with the work and means of other institutions in this and other countries.

To be sure some help, timely, if relatively small, has been supplied by President Morton, who, in the words of Mr. Edward B. Wall, M.E., president of the Alumni Association, in a recent address, "has devoted to Stevens his ability, his energy, his time, his tact and his private fortune;" but, for such a work as this, an amount of between $40,000 and $50,000 is but a trifling element, except as it may have supplied a great need at a critical time, as when he fitted up and presented the new workshop in 1880, established the Department of Applied Electricity in 1883, and endowed a chair of engineering practice in 1888.

The fact still remains that the great success of the Stevens Institute has placed it in the position of a business which has outgrown its plant, and which must refuse orders for lack of capacity to fill them promptly.

With a manufacturing establishment the remedy would be simple, because such an increase in business would warrant an increase in capital invested, which could be secured in the usual ways. But with an educational institution, the case is different. Here there is no increase in earning capacity which will pay interest on the increased investment. On the contrary, as each student costs more than he can, as a rule, afford to pay, an increase in the number taught calls for an increase in the endowment fund, or its equivalent.

Realizing this situation, the alumni of the Stevens Institute have taken in hand the raising of an additional endowment fund, which may be used in the erection of new buildings, or otherwise go to the permanent support of the institution.

In this work we wish them all success, and are free to say that we know of no place where one or more of those liberal donations which have distinguished this era and this country would do so much good to the community at large and be a more lasting and creditable monument to the donor than the Stevens Institute of Technology.

In this connection we may say that we know personally that the name of any donor would be permanently associated with any department, building, chair or scholarship which he might endow or present.

The names of the trustees and faculty given below are eminently calculated to inspire confidence that the future administration of the Institute's affairs in all branches will be of the best character. The trustees are Andrew Carnegie, of New York; S. B. Dod, of Hoboken; A. C. Humphreys, M.E., of Philadelphia; Wm. Kent, M.E., of New York; Chas. Macdonald, C.E., New York; Hon. A. T. McGill, Chancellor of New Jersey; Henry Morton, Ph.D., Hoboken; E. A. Stevens, Hoboken; and Mrs. E. A. Stevens, Hoboken.

The faculty consists of: Henry Morton, Ph.D., President; Alfred M. Mayer, Ph.D., Professor of Physics; De Volson Wood, A.M., C.E., Professor of Mechanical Engineering; J. Burkitt Webb, C.E., Professor of Mathematics and Mechanics; Charles W. MacCord, A.M., Sc.D., Professor of Mechanical Drawing; Albert R. Leeds, Ph.D., Professor of Chemistry; Charles F. Kroeh, A.M., Professor of Languages; Rev. Edward Wall, A.M., Professor of Belles Lettres; Coleman Sellers, E.D., Professor of Engineering Practice; James E. Denton, M.E., Professor of Experimental Mechanics and Shopwork; Wm. E. Geyer, Ph.D., Professor of Applied Electricity; Thos. B. Stillman, Ph.D., Professor of Analytical Chemistry; Adam Riesenberger, M.E., Assistant Professor of Mechanical Drawing; Wm. H. Bristol, M.E., Assistant Professor of Mathematics; D. S. Jacobus, M.E., Assistant Professor of Experimental Mechanics and Shopwork; Robert M. Anderson, M.E., Instructor in Applied Mathematics. Graduate Assistants: J. H. Cuntz, C. E., M.E.; William J. Beers, M.E. Instructing Mechanic in Workshops: Matthew Lackland.

Referring to our illustration on the title page of this number, Fig. 3 is a general bird's-eye view of the Institute and its surroundings.

The Institute building proper consists of a main portion running east and west, with three wings running north, or back from it. Of these wings that to the west, or left side of the engraving, is occupied at present by the Chemical Department. The central and largest wing accommodates in two stories and basement the machine shop and foundry; while the easterly wing is occupied by the Department of Applied Electricity.

To the north of this east wing is seen the building of the Stevens School, or preparatory department, where over 250 pupils are now taught.

The arch and tower visible over the east end of the main building constitute the entrance of the Castle Point estate, occupied by the family of Edwin A. Stevens, the founder of the Institute.

To the right is seen the Hudson River and the portion of New York lying between Eighth and Thirty-second Streets.

Fig. 1 is an interior view of the Electrical Laboratory. At the left is the photometer (an inclosure made entirely dark and provided with a "Sugg photometer" and other appliances), and down the middle of the room are a series of brick piers with slate tops, to give steady support to the delicate instruments used in electrical measurements.

Fig. 2 is a view showing a portion of the main workshop. It, however, does not give an adequate idea of the number and variety of "machine tools" present, as many of these are concealed by others or are outside of the range of view.

Fig. 4 shows the Blacksmith Shop and Foundry, with the cupola furnace at the far end, where iron is melted to make castings.

Fig. 5 represents the experiment room of the Department of Experimental Mechanics, in which a great variety of work is carried on, not only with standard machines for determining strength of material, but also with steam and gas engines, pumps, compressors, and the like, in such a manner as to best show their economic efficiency.

Mental Improvement after Trephining.

This important subject is treated of in an article in a recent number of the *Medical News* by Dr. Hugo Engel, of Philadelphia, with special reference to a case in which an operation of this nature was carried out. The patient was a boy fourteen years old, who was said to have been mentally bright and physically healthy until his sixth year, when he became subject to convulsions. These began one day without any apparent cause, and have never since ceased for any length of time. There was no family history of epilepsy or insanity, and there was no accident to account for the onset of convulsions. The fits had been becoming gradually more and more frequent, until at last he was having as many as twenty-one in twenty-four hours. But the interesting point is that the boy's intellect is said to have been, up to the time at which the fits commenced, of a higher order than is usually met with in a boy of his age; but since the fits began a gradual deterioration had been taking place, until he became dull and vicious, and finally seemed simple and almost idiotic and not unfrequently maniacal. There was a peculiar conformation of the skull, the appearance being as if it had been crushed in at the junction of the parietal and frontal bones, and Dr. Engel seems to have regarded this as the result of premature closing of the fontanelles and too early union of the sagittal and coronal sutures, and, from the effect of this on the brain apparently, he was in the state of extreme mal-development which he showed. Except that he was endowed with speech—of a guttural and monotonous character, it is true—he resembled a savage young animal rather than a boy, in his behavior generally. Under a systematic use of the bromides the convulsions became much less frequent and less severe, but no great change was evidenced in the mental condition, and it was decided to operate with the view of relieving the abnormal pressure on the brain, which, from the conformation of the skull, it was thought must be present. Two operations were carried out by removing portions of bone from the right frontal and parietal bones immediately contiguous to the coronal suture. The second operation was carried out after an interval of three months had elapsed from the first. For five weeks after the first and for two weeks after the second operation he had no attacks, but after that they increased in frequency, but never became so frequent as before, while their character was very much changed, so that instead of severe convulsions with clonic spasms, he now had attacks of loss of consciousness, with slight twitchings; but the chief improvement was in his mental condition, and from an idiotic, sulking savage he developed into a bright, lively, and good natured boy. His former irritability and moroseness were replaced by good nature, and now to all inquiries he made intelligent replies, whereas formerly he only sulked when asked questions. He also expressed a wish to go to school, and his perception was wonderfully quickened, so that a complete change was the result of surgical interference in this case. Such a result is, of course, extremely significant; but it remains to be seen in what cases operative measures are likely to effect so much as they apparently did in this case. But at least Dr. Engel and his surgical colleague, Mr. Packard, are to be congratulated on the brilliant success which followed interference in a case which could not, even to the sanguine, have appeared very promising.—*Lancet.*

Honors for Mr. Edison.

The Society of Arts, London, has awarded the Albert Medal to Mr. Edison in consideration of his distinguished services in the progress of electric lighting, telegraphy and telephony. The Albert Medal was first awarded in 1864, and has often been given to distinguished electricians, among whom may be mentioned Faraday in 1866, Cooke and Wheatstone in 1867, Sir William Thomson in 1879, J. P. Joule in 1880, and Helmholtz in 1888.

THE CROWDED CONDITION OF THE PATENT OFFICE.

The United States Patent Office is not only self-supporting, but, according to a recent report of the commissioner, there is a balance of over $4,000,000 to the credit of the Patent Office in the Federal Treasury. This means that the inventors of the country, as a special class, have paid to the government just so much more than the cost of examining and passing upon their applications for patents, and the issue thereof. It is this feature of the patent business, as a branch of the public service, which gives especial significance to the illustrations we to-day present, showing the crowded and congested condition of the Patent Office business.

That this is no new complaint our readers know well, but the evil is steadily growing, and it is difficult to estimate its possible consequences in thousands of instances of which the public may never hear. To say that the work of a patent examiner requires above all things a clear head, thorough deliberation, wide knowledge, and mature judgment, and that to these are to be added, in each special branch, a good acquaintance with what inventors have already done and what has become embodied in the practical work of a wide variety of industries, is to state only the simple facts. But these are by no means the limitations of the examiner's field.

The number of issued patents now mounts up to nearly half a million, to say nothing of the caveats on file and the thousands of applications for patents all the time in course of examination. It is a fundamental principle of the examiner's work that all these, with their numerous complexities and possible constructions, must be held to be at least fairly understood in taking up each new application, to see, in connection with accurately noted dates, what bearing, if any, they have upon the claims of each new petitioner for the protection afforded by a legal title upon which is stamped the seal of the United States Patent Office. And not only must these records of our own Patent Office be consulted, but the patents issued by other governments must likewise come under a similar examination, also all forms of printed records, in periodicals, books, etc. The latter are not, it is true, always held to form the same value as proof of priority or actual invention as a legally issued patent, but the examiner must have them in mind in the understanding and proper construction and possible limitation of an inventor's claims. In all this he acts, in the great majority of cases, as both judge and jury upon the petition of an applicant for a patent.

Perfect system, thorough organization, are necessities in satisfactorily conducting this vast work. Without these conditions, the best legal skill, the most comprehensive technical information, the acutest analytical brains, would lamentably fail to do anything like substantial justice to the thousands of inventors and the public. As a part of this system, all applications for inventions are classified according to their nature or subject. There are now more than two hundred classes and nearly five thousand subdivisions. Such division, involving in many cases rather a grouping and distinguishing of similar lines than a complete separation, calls for an abundance of room, not only for the orderly keeping and arrangement of the records, but for the facilitating of the work of those who have to conduct the examinations. Without such order in arrangement and convenience of access, it is not possible properly to conduct searches, make comparisons, and form reliable judgments. That the work of the Patent Office is done as well as it is, under the difficulties of the present situation, has long been a subject of admiration among those best able to judge of what is accomplished.

It requires but a glance at our illustrations to comprehend the difficulties under which the work is prosecuted. The views are from photographs made during the ordinary hours of business, and represent the everyday condition of the rooms, the latter, however, appearing larger than they really are, as a necessity in locating the camera to obtain the most essential features. The first view, in room 155, shows the department to which go all applications for patents relating to chemistry, medicines, fertilizers, photography, sugar and salt, this room being the headquarters of all the assistants in this class of work. The room of the commissioner, in the adjoining picture, appears rather larger, but is only a little more roomy than a commodious bath room, while that of the assistant commissioner, though apparently the most comfortable of all the rooms shown, is a long distance away from the chief clerk and other employes. The picture representing attorneys making searches suggests the reality of "searching for knowledge under difficulty" in a very practical way. In picture 5 we see the headquarters of the department which has charge of civil engineering subjects, bridges, railways, masonry, excavating, hydraulic engineering, iron structures, fire escapes and ladders, etc.

The chief clerk, in view 6, is apparently among the very few favored ones as to room, and the view of room 7 shows that the desk and record cases are very compactly arranged. This room is the principal one of the department of boots and shoes, clasps, buckles and buttons, harness, hose and belting, and leather-working machinery. In room 30 are examined applications for clutches, conveyors, elevators, hoisting, journal boxes and pulleys, mechanical motors, etc. Room No. 85, shown in view 9, at the top of the page, is devoted to carriages and harness and railway supplies, view 10 showing the electricity headquarters, and view 11 that of artificial stone, lime and cement, clay and pottery, glass, paving, roofing, paper making, etc. In view 12 is shown the department of advertising, baggage, packing and storing vessels, etc., while in view 13 are builders' hardware, cutlery, dentistry, locks and latches, safes, surgery, etc., and in view 14 is seen the apartment of the examiner for acoustics, draughting, horology, measuring instruments, optics, etc. Room No. 91, shown in view 16, is devoted to electric lighting and signaling and telegraphy and telephony. One of the draughtsmen's rooms, shown in view 15, indicates that drawings can be made in such quarters only with the greatest difficulty, and this and all the other departments are in striking contrast with the ample room, perfect light and thorough ventilation afforded in the office of the SCIENTIFIC AMERICAN, where the work carried on in the preparation of applications for patents is of just the same kind as that prosecuted in the Patent Office at Washington.

The Patent Office examiners have no space for the orderly arrangement of their records, which must in many cases be piled up in out-of-the-way places, inconvenient of access, and therefore almost necessarily in a state of chronic confusion; the operative force is closely crowded into small, poorly ventilated compartments, where work can only be done under the greatest disadvantages, and these evils are rapidly growing worse with the augmentation of records, the increasing number of applications, and the consequent tendency to the further crowding together of the employes. It needs but a glance at the illustrations to convince one that the trouble has long since passed the acute stage.

WILLIAM EDGAR SIMONDS, COMMISSIONER OF PATENTS.

William Edgar Simonds, the present Commissioner of Patents, was born in Collinsville, Conn., November 24, 1842. He was educated at the common and high schools of that village and also at the Connecticut State Normal School. He taught school for a year or two. In August, 1862, he enlisted as a private in the Twenty-fifth Connecticut Infantry, his brother and his step-father, the only other male members of the family, having already enlisted for three years. He was soon made sergeant-major of the regiment, and at the battle of Irish Bend in Louisiana, on the 14th day of April, 1863, he was promoted to be a lieutenant, and was discharged from the service with his regiment in August, 1865.

He graduated from the Yale Law School in 1865, and since that time has practiced law in Hartford, Conn. In 1883 he was chairman of the Committee on Railroads in the Connecticut House of Representatives. In 1885 he was the speaker of the Connecticut House of Representatives. In 1888 he was elected a member of the Fifty-first Congress, in which body he served. While a member of the Fifty-first Congress, an international copyright bill was reported by the Judiciary Committee, debated for two days, and failed of passage by a negative majority of about forty. Mr. Simonds then redrafted the bill, adding its famous thirteenth section, and procured its favorable report to the House. On the third day of the short term he secured its passage through the House, after a vigorous fight, by a majority of about forty. By reason of parliamentary tactics and maneuvers, it had to pass the House, in one shape or another, three times subsequently, each time after a fight over it, the last passage being about two o'clock on the morning of March 4, 1891, the day on which Congress adjourned. For this service in connection with international copyright the government of France conferred upon him the Cross of the Legion of Honor. He has filled the lectureship on patent law in the Yale Law School since 1884. Yale University gave him an honorary degree at the 1890 commencement. He is the author of a "Digest of Patent Causes," a "Digest of Patent Office Decisions," a work on "Design Patents," and a small work known as a "Summary of Patent Law." His commission as Commissioner of Patents dates July 1, 1891, and he entered on the performance of the duties connected with the position on August 1, 1891.

What Organ First Relapses into Slumber?

It is said by scientists to be a fact that all our senses do not slumber simultaneously, but that they fall into a happy state of insensibility one after another. The eyelids take the lead and obscure sight, the sense of taste is the next to lose its susceptibility, then follow smelling, hearing, and touch; the last named being the lightest sleeper and most easily aroused. It is curious that, although the sense of smell is one of the first to slumber, it is the last to awake. Hearing, after touch, soonest regains consciousness. Certain muscles and parts of the body begin to sleep before others. Commencing with the feet, the slumberous influence works its way gradually upward to the center of nervous action. This will explain the necessity of having the feet comfortably warm before sound sleep is possible.

Pasteurized Milk.

All methods of sterilization that are in use in this country have the disadvantage of giving to the milk the taste which is peculiar to boiled milk, and also of rendering it less easily absorbed by the body. In France and Germany a method has been adopted which accomplishes the purpose without injuring the taste of the milk. Machines are in use in Paris and some other cities which will heat great quantities of milk to a temperature of about 155° Fah. for a few minutes, and then cool it rapidly to a low temperature. The method has been called the pasteurization of milk. It does not kill all the bacteria, but it does destroy so many of them that it greatly increases the keeping properties of the milk. Moreover, it almost entirely destroys the danger from disease germs in milk, since nearly all forms likely to occur in milk are killed by this temperature. The advantage of this method is that the temperature of 155° Fah. does not give to the milk the taste of boiled milk, which most people find unpleasant, and does not render the milk difficult of digestion. These pasteurizing machines have not yet been introduced into this country, and the opportunity exists for some one to develop a thriving business by furnishing pasteurized milk in our large cities. A little experience with its superior keeping properties and a little knowledge of its great wholesomeness would soon create a demand for it in America, as it has already done in the larger cities of France and Germany.—*Prof. H. W. Conn, in Popular Science Monthly.*

A SPICY EXHIBIT.—At the great exhibition next year, a Pennsylvanian firm will exhibit a map of the United States, 18 feet by 24 feet, made entirely of pickles, vegetables, fruit, etc., preserved by the company which makes the exhibit. The State lines will be accurately shown and the lakes and rivers will be represented by vinegar. The larger cities will be indicated by spices. The whole will be covered with a single piece of plate glass, which is being specially made for the purpose. The expense of this interesting exhibit of the pickling and preserving industry will be $15,000.

No. 1. Room No. 155. Examiner J. B. Littlewood and Assistants.
No. 2. Commissioner of Patents, William E. Simonds.
No. 3. Attorneys making Searches in the Patent Office.
No. 4. Assistant Commissioner of Patents, N. L. Frothingham.
No. 5. Room No. 32, Examiner B. W. Pond and Assistants.
No. 6. Chief Clerk, Jos. L. Bennett.
No. 7. Room No. 105, Examiner Jno. D. Hyer and Assistants.
No. 8. " 30, " W. L. Aughinbaugh and Assts.

VIEWS IN THE PATENT OFFICE—SHOWING ITS CROWDED CONDITION.

No. 9. Room No. 85, Examiner H. P. Sanders and Assistants.
No. 10. " 87, " G. D. Seely " "
No. 11. " 211, " T. J. Hudson " "
No. 12. " 111, " Greely " "
No. 13. Room No. 153, Examiner A. G. Wilkinson and Assistants.
No. 14. " 221, " F. A. Seely " "
No. 15. One of the Draftsmen's Rooms.
No. 16. Room 91. Examiner G. Bissing and Assistants.

VIEWS IN THE PATENT OFFICE—SHOWING ITS CROWDED CONDITION.

THE GRAND CANYON OF THE COLORADO.

BY H. C. HOVEY.

Tourists should know, to begin with, that, as there is but one Niagara, and a single Mammoth Cave, so there is only one Grand Canyon. The next point to be plainly stated is that the canyons washed by the Colorado River on its way to the Gulf of California are not in the State of Colorado, but sweep down from Utah through northern Arizona. This information is by no means superfluous; for travelers of average intelligence and presumable veracity have repeatedly assured me that they had visited the Grand Canyon, when in fact they had not been within 500 miles of it. They were thinking of the Royal Gorge, or other gorges that are commonplace compared with the enormous and magnificent canyons of the Colorado.

Clarence Dutton's costly atlas of this district is rarely found, except in large libraries. The atlas sheets prepared with skill and conscientious care by the U. S. Geological Survey are not yet accessible to the public. Such progress has been made in Arizona, during the past decade, both as regards exploration and development, that the map makers find it hard to keep up. Meanwhile the maps ordinarily found in the schools, and elsewhere, abound in errors. The accompanying sketch, modified from one by R. B. Stanton, C.E., may be found serviceable so far as the modes of approaching the Grand Canyon are concerned.

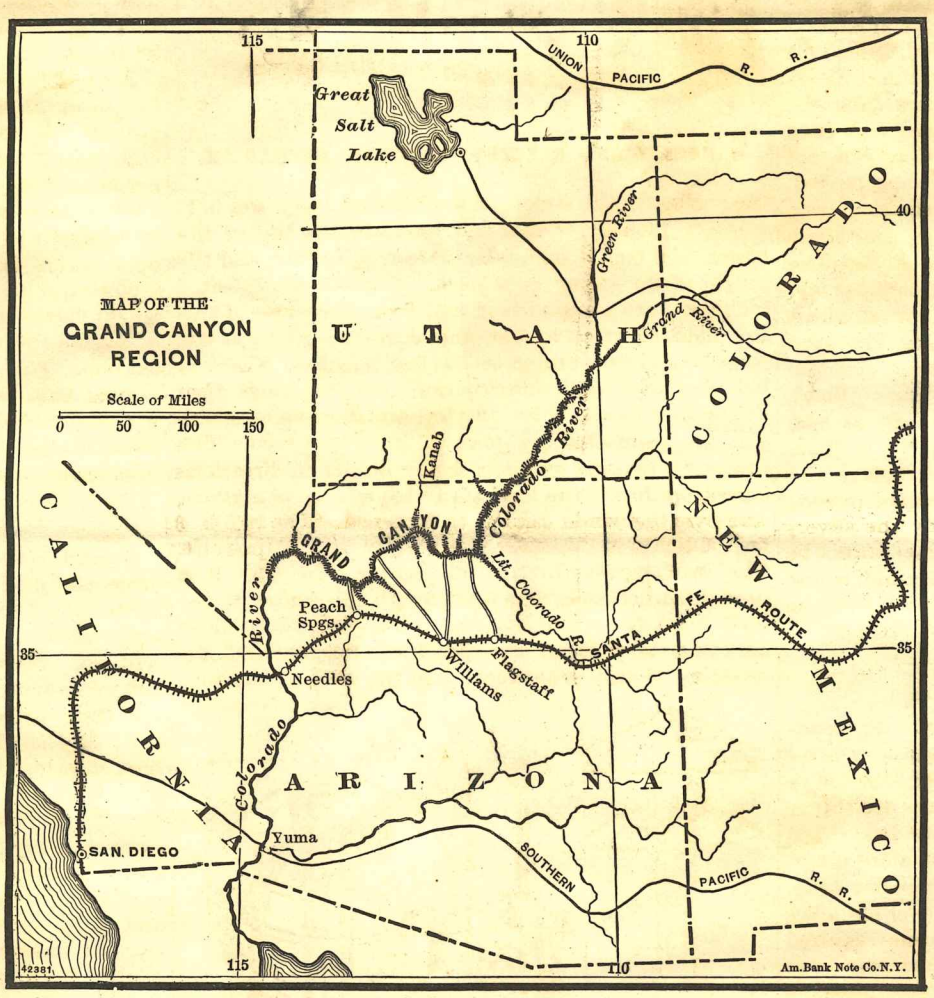
Whatever might be true for explorers ready for wild marches and desert work, the only points from which the Grand Canyon is accessible for tourists lie along the Atlantic and Pacific division of the Great Santa Fe route. Being the first visitor of the season this year, my experiences may be of use to others. Arriving in Arizona in March, the heavy snow drifts made it impracticable to reach "the Rim" by any route until they had partially melted. But on returning to the Territory, after a fortnight spent in Southern California, I resolved to make the attempt, although warned of its difficulties, and aware that last year there were no visitors prior to May, a month later than the date of my trip.

There are four different routes from the line of the railroad. Each of these has its attractions and enthusiastic advocates. The trail from Peach Springs, over which a line of stages is run by Mr. Julius Farley, has the decided advantage of being far shorter than any other, reaching the Grand Canyon in 18 miles, with an easy grade and plenty of water. It first strikes Diamond Creek, which leads into the main canyon at the apex of a great bend. The scenery is picturesque and impressive; and it was here that Lieutenant Ives, in April, 1858, obtained his first view of this wonderland. It was here also that Professor Newberry descended to the inner gorge. If one had the time, and could afford to make more than one trip, he would be rewarded for including the Peach Springs route in his plans. But the walls are lower here than at places reached by other routes, and therefore few tourists now make the trip. From Williams there are two roads. One leads to the junction of the Cataract Canyon with the Grand, an estimated distance of 65 miles, and is traversed by a good stage line, of which Mr. W. W. Bass is the proprietor. In the side canyon just named are numerous sparkling cascades, the finest of which is the "Bridal Veil." In this vicinity dwell the peaceful Supai Indians, whose boast it is that in all their history as a tribe they have never killed a white man. They gain their living by farming, raising peaches and other fruits, eked out by gathering acorns and the nuts of the edible pine. There is little profit from the chase, now that the bison and antelope are killed off. In reply to my inquiries as to what the government has done for them, I was told by Mr. Bass that appropriations had been made amounting to a total of $900; but that only $40 of this money had been paid over to the Indians up to March 10 of this year.

The Supais have a unique burying ground in the Long Canyon. Mr. Louis Buchere, who visited the locality last February, tells me that it is their custom to roll their dead in blankets, along with their guns and accouterments, and deposit them in layers between the rocky shelves under the rim. Their horses are then forced to make the awful leap from the rim to the rocks below, which are actually whitened with the bones of the sacrificed steeds. From others I learned that this heathenish custom is now being abandoned. Mr. Bass kindly offered me every facility for investigation into the condition and customs of this interesting tribe, as well as for exploring more fully the inner gorge as reached by his route; but it was impracticable for me, at that time, to avail myself fully of his generosity. I shall have occasion, in another connection, to refer to the splendid scenery thus brought to view.

Rowe's stage route also starts from Williams, and reaches the Grand Canyon in 60 miles by the odometer. This is sometimes called the Bright Angel trail, because it enters the canyon opposite the mouth of the Bright Angel creek. Half way down the chasm some singular cliff dwellings are seen, and there are others half a mile west of them. Some of them are easily accessible; while others can be observed only from adjacent crags. The doors being on a miniature scale, only 18 inches high by a foot wide, and the windows correspondingly small, these have been styled "Liliputian houses," and the supposition advanced that they were once inhabited by a race of pygmies. But the probability is, in my opinion, that they were not intended for habitations, but for granaries. A series of elevations taken in April last, at mile intervals, shows the highest altitude above the sea level, between Williams and the canyon, to be 6,700 feet, and the lowest 5,650 feet.

The Flagstaff route is somewhat longer than any of the others, being 67 miles by odometric measurement. This distance might be considerably shortened by a resurvey of the road, as it now makes some quite needless windings among the buttes and mesas. Its highest elevation above sea level is 7,436 feet and its lowest is 6,261 feet. These figures are official, having been taken under the direction of Mr. T. R. Gabel, superintendent of the Atlantic and Pacific Railroad at about the time of my own visit. The conclusion necessarily is that we strike the rim at its highest altitude, and where the widest view is commanded of the system of gorges combining to make the Grand Canyon so wonderful. This route was chosen for the members of the International Geological Congress when they visited this region last fall, by invitation of Major J. W. Powell. It has also been selected by the authorities for the projected Grand Canyon railroad branch from Flagstaff, of which a beginning has already been made. Meanwhile, as I was told, a line of first-class coaches is to be immediately established. Hence I shall describe this mode of approach more fully than the others.



THE GRAND CANYON OF THE COLORADO.

Flagstaff is a good starting point. It stands amid a noble forest of yellow pines that are rapidly being converted into lumber by the Arizona Lumber and Timber Company, of which Mr. D. M. Riordan is the manager, with about 500 employes. The tall tree yet stands to whose top a flag was fastened one Fourth of July—a circumstance suggesting the odd name of the young city. There is an extensive brown sandstone quarry here, from which blocks of any desired size can be taken without flaw or seam. The town is the rendezvous for lumbermen, ranchmen, miners, and cowboys from a wide region around. The Bank Hotel, kept by Mr. Coalter, is the best in Northern Arizona. In its parlors I met Dr. Dorchester, the U. S. Superintendent of Indian Schools; Judge J. M. Sanford, of Williams, who has been familiar with the canyon district for thirty years; and Mr. C. H. McClure, who, with four other practical miners, spent last winter in the profound depths of the Grand Canyon, where there is eternal summer even though the drifts in the upper chasms under the rim may be many feet deep.

Later in the season the trip might be made in carriages, or a large party might charter an omnibus. But my preference was a substantial "buckboard," which I hired from the stables of Mr. E. S. Wilcox, who also accompanied me as driver. We took bedding, rations and fodder, and of course my kodak and geological kit, but as few extras as possible, in anticipation of miry roads and snow drifts.

Winding around the foot of Mt. Eldon, a singular mass of columnar basalt, we took a northwesterly course, following the track made by last year's visitors. West of us sprang aloft the snowy peaks of the San Francisco Mountains, part of a broken range known as the Mogollon Mountains, which were in sight all the first day. These are said to be the highest hills in Arizona. The road, instead of being muddy, was naturally paved with volcanic cinders. Huge blocks of red and black lava lay scattered in wild confusion. These in turn made way for billows of ashes and cinders extending as far as the eye could reach. But it was not a barren region; for these ashes were fertile when irrigated by the melting snows. Our way lay through a vast park adorned by sturdy pines (*Pinus ponderosa*) from 60 to 100 feet high, and from two to six feet in diameter. These trees stand well apart, as if planted by some prehistoric landscape gardener; and they often rise, like noble shafts of brown marble, for 40 feet before sending out their lowest branches. Except near the railroad this magnificent domain has not yet been invaded by the ruthless lumberman.

Suddenly we came to the margin of what resembled a broad black sea—a cinder plain without the slightest sign of life. Above it swelled the cone of an extinct volcano. As I had heard that there were ancient cave dwellings near the summit, we resolved to explore. Leaving our horses at the foot, an easy climb brought us to the apex, perhaps 600 feet above the plain. Here, in the rugged tuff, were thirty or more rude grottoes of artificial excavation. Their former occupants had a wide prospect, and could hardly have been surprised by any ordinary foe. The only relics we found were countless fragments of water jars. Some of these are chiseled, not painted; others painted inside but not outside; others the reverse. Mr. Wilcox kindly gave me an entire jar exhumed in the vicinity, of elegant proportions, and elaborately decorated with geometric designs resembling the well known "Grecian key." Similar jars were afterward shown to me by Mr. D. M. Riordan; the workmanship in every way excelling the pottery made by the most skillful modern Indians.

At Smith's Tank, where we dined, we met Superintendent Gabel and his surveying party, on their homeward way. Resuming our journey, we presently found the great forest yielding to detached groves of junipers and pinyons, the nut-bearing pine, whose young cones already gave promise of an abundant harvest. On our right a trail branched off leading to the Moqui reservation, beyond the Colorado Chiquito. Soon climbing the crest of the divide, we were surprised by one of the finest imaginable landscapes. The mesas were clad by the groves already described. But the broad plain expanded before us clothed with the crisp and silvery buffalo grass not yet entered on its brief term of verdure, with here and there a flowering cactus, or a truculent Spanish bayonet. Myriads of prairie dogs had their singular villages on this ample area, with occasionally the larger burrows of the badger and coyote. Above the plain arose the dome-like cones of numerous extinct volcanoes, their flanks somber with black cinders, but their tops as radiant as sunset clouds with fiery red lava; while the horizon was bounded by snowy mountain chains. In some of the ancient craters there are lakes, along whose borders may be gathered specimens of native sulphur and various rare minerals.

Night found us at Cedar Ranch, one of the trysting places of the jolly cowboys in the employ of the Arizona Cattle Company, whose hospitality was ample, though primitive. Grouped around a blazing fire of pine knots, we found them ready for conversation on politics, religion, science, commerce, or war. By daybreak they were off for the Coconino Basin, mounted like centaurs, belted and spurred, heavily armed, and each with a lasso at his saddle-bow ready for a "round-up." While they sped away like the wind, we plodded on with our buckboard. We soon entered

a small canyon, whose right wall was rugged lava, while the left was Aubrey limestone. On emerging and climbing an eminence, we saw that this lava wall was the margin of a terrace, several of which were visible, being successive overflows from the volcano around whose base they had been formed. Our journey for the last twelve miles of it was over a road which, however fine it may be from May to November, was for us but an alternation of stony ridges and miry bogs, with occasionally a lingering snow drift. It was after dark when we rattled at full speed down the long limestone hill leading to the welcome cabin of honest John Hance. Under a sheltering hill, beside a living stream, nestled amid gigantic pines, some of which have been so felled as to fence in the spacious door yard, is the home of this mountaineer. He has probably done more actual exploring of the canyons of the Colorado than any other Arizonian; and it is his boast that, in the period of two years, with his own unaided hands, he made the famous Hance Trail, from the highest rim down to the river—certainly one of the greatest engineering feats ever accomplished by one man. William Mulvernan, sheriff of Yavapai County, and John Francis, sheriff of Coconino County, assisted by John McGowan and R. A. Ferguson, recently surveyed the Grand Canyon from the head of the Hance Trail, and determined its depth to be 6,675 feet vertically from the rim to the river. The trail covers 4,000 feet of this in 7,050 feet, and the remainder at a much easier grade.

After our tired horses had been cared for, and our own hearty supper duly disposed of—matters demanding our first attention—I was determined to have a look at the canyon, although it was after nine o'clock. In solitude I climbed the hill. The distance from the cabin to the rim is less than 300 yards. But even when within a hundred feet of the mysterious rim, not a sign of the glorious vision awaiting me appeared. For a moment I paused with a natural shrinking from what I knew must lie beyond that calm, untrodden snow bank. The full moon was riding in a cloudless sky. The wind soughed through the tall pines and fragrant junipers. Huge rocks cast their shadows across my way, and seemed to be watching like grim sentinels. At length, resolutely, I advanced through the snow, and stood alone on the dizzy verge. Bending over it in a kind of sacred horror, I beheld, at last, what for many years I had longed to see, the fathomless, boundless abyss, with its myriads of chasms and cliffs, fretted ruins, slender spires and massive towers, all under the beaming stars and flooded by the silvery moonlight. And this sublime chaos, such as cannot be found elsewhere in the whole world, and amid whose depths we were to venture on the morrow, was the Grand Canyon of the Colorado.

The Doctor and Good Roads.

The sentiment in favor of improving country roads is growing every year. It has reached our legislative assemblies, and bills are being introduced in order to secure State aid in the matter. Good roads are things which no class of persons would appreciate more than physicians, and to none would they bring more direct personal comfort, and even practical financial help. On a good road the country doctor can travel ten miles an hour, on a bad one barely five. The time required in doing his work is doubled, the physical weariness is increased, the amount of visiting rendered possible is curtailed. Besides this, the patient suffers, for the doctor's visits are delayed and less numerous. He cannot watch the patient so closely, and he brings to his work a wearied body.

Perhaps the horse would argue most eloquently of all, if he could speak in favor of good roads. His working life would be lengthened and his working days made easier.

With good roads the bicycle could be utilized, and through its invigorating influence, perhaps, the country doctor would cease, as years rolled on, to become obese from too much sitting in a wagon, his wits would be sharper, his professional work better.

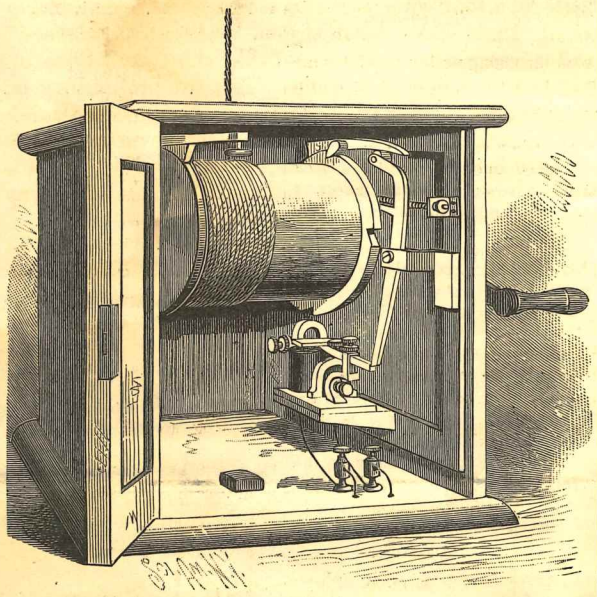
By all means, then, let the doctors take up the gospel of good roads and urge forward their construction. They make intercourse more easy, work less burdensome, life more enjoyable; and they are, in fine, an index of the progressiveness and civilization of a community.—*Med. Record.*

Microscopic Drawing.

Place the body of the microscope horizontal; remove the mirror; put the slide on the stage; condense the light upon it by means of the bull's eye, taking care to center the light; attach the concave mirror to the front of the eyepiece by means of a spring or a piece of thin wood. Have its surface at an angle of 45° with the plane of the anterior glass of the ocular. This will project an image of the object on the paper beneath. If the outer ring of light is circular, there will be no distortion. With a black cloth exclude all outer light, covering both your head and the instrument. Mr. Hopewell Smith draws any section easily in this manner, including magnifications of 600 diameters.

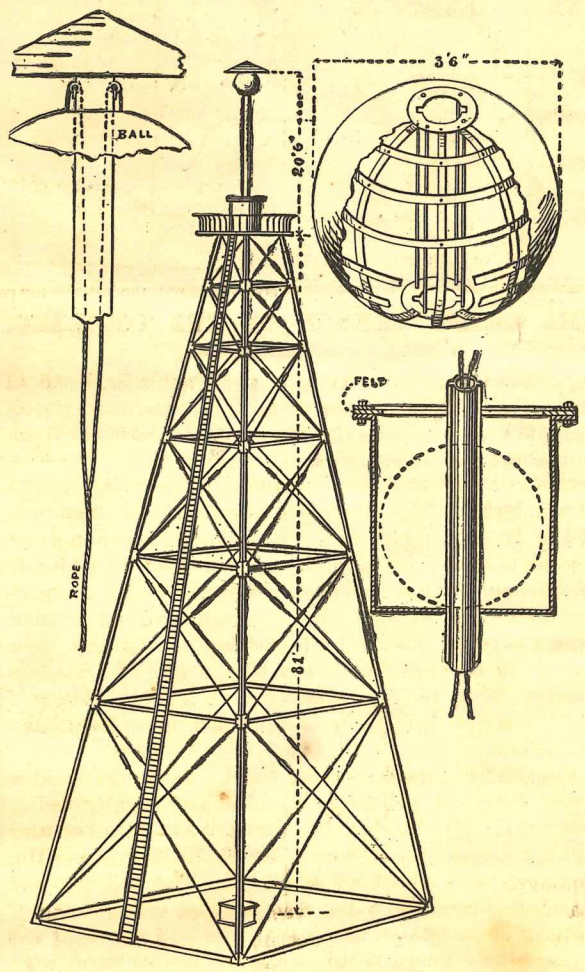
THE WESTERN UNION TIME BALL SERVICE.

Since the fire which destroyed the upper stories of the Western Union Telegraph building, the time ball service has been suspended. The old staff and ball were mounted on the tower in the front of the building. As the new building has been completed another tower has been built for special service of the time ball system. This tower is built of open iron work, and through its center a ladder runs up to the top. From the top a staff of hollow iron piping with two feathers running down opposite sides of it rises, and is surmounted by a cap. As regards dimensions, the tower rests on the roof of the main building, 163 feet above



WINDLASS AND ELECTRIC TRIPPING MECHANISM.

the surface of the street. The base of the tower is 24 feet, 6⅜ inches by 25 feet, 4 inches; the top of the tower is 4 feet, 3 inches by 5 feet, ⅝ inches; and the height of the tower is 81 feet. A platform 7 feet, 5 inches square surmounts it, and from the center of this the flagstaff rises 20 feet and 6 inches, giving as the total height from the street 264 feet, 6 inches. The time ball is of very light construction; notched rings that fit the staff loosely form the top and bottom elements and are connected by four ½ inch iron rods. The contour is secured by hoop iron running in directions corresponding to the latitude and longitude of a globe, and over the whole canvas is fastened. The ball is 3 feet, 6 inches in diameter, and weighs only 35 pounds. The staff passes through its center. To raise it a double lead of rope runs up through the center of the staff; the two ends of the rope pass over two pulleys on opposite sides of the staff near the top and, descending thence, are attached to the ball at the top.



THE WESTERN UNION TIME BALL TOWER.

The two leads join each other a little distance down, and a single rope runs thence to a windlass, which is contained in a box at the base of the tower.

By tripping mechanism the ball is released at noontime and falls down the staff. To receive it an air box is provided at the bottom which cushions its fall. This is a circular box 4 feet high and 3 feet, 6 inches in diameter, and therefore of just such size as to receive the ball. A sort of flange or washer of felt is carried around the mouth of the box, so that the ball cannot by any possibility strike any hard material in its descent. As it falls, the air in the box can only escape slowly, so that it forms a true cushioning device.

The tripping mechanism is contained in the box with the windlass. On a flange projecting from one end of the windlass four notches are cut with which a pawl engages as the windlass is wound up, preventing it from unwinding or turning the wrong way. The pawl is carried by an arm pivoted at one end. If the arm were raised, it is evident that the pawl would be withdrawn from the notch and the windlass would be free to unwind. The tripping mechanism effects the raising of this arm. A lever nearly vertical is pivoted at its center, and a roller at its upper end touches the rear end of the pawl lever, which at this point is bent downward. A spring tends to draw the upper end of this lever backward. If it were so drawn, the end of the latter would be raised and the pawl released, owing to the downwardly curved shape of the pawl lever. To prevent the spring from doing this, the lower end of the lever is caught by a projecting bar attached to the armature of an electro-magnet. The whole is so arranged that by connecting the magnet with an active circuit its armature is attracted, which draws the bar out of engagement with the vertical lever. The spring on the latter then draws its upper end back, thereby raising the pawl lever and releasing the pawl. The windlass and tripping devices occupy but little space, the whole being contained in a cubical box only 18 inches each way.

A special clock at Washington is connected to the circuit of the electro-magnet, the whole being on open circuit. When the clock in its motion closes the circuit, which it does precisely at noon, the electro-magnet is excited, its armature is attracted, releasing the vertical lever whose upper end is drawn back and trips or releases the drum of the windlass, and the ball at once begins its descent. From the above it will be seen that it is the beginning of the fall of the ball which marks the time of noon. The system formerly in use was different in several respects from the present one. The one we illustrate is based largely on the results attained at Washington, and its operations will undoubtedly be very perfect. By the time this paper reaches our readers the new service will have been inaugurated.

Hints for Boys.

A gentleman advertised for a boy to assist him in his office, and nearly fifty applicants presented themselves before him. Out of the whole number he selected one, and dismissed the rest. "I should like to know," said a friend, "on what ground you selected that boy without a single recommendation?" "You are mistaken," said the gentleman, "he has a great many. He wiped his feet when he came in, and closed the door after him, showing that he was careful; gave up his seat to that lame old man, showing that he was kind and thoughtful; he took off his cap when he came in, answered my questions promptly and respectfully, showing that he was polite and gentlemanly; he picked up a book, which I had purposely laid upon the floor, and replaced it on the table, while all the rest stepped over it or shoved it aside; and he waited quietly for his turn, instead of pushing or crowding, showing that he was honest and orderly. When I talked with him I noticed that his clothes were carefully brushed, his hair in nice order, and his teeth as white as milk; and when he wrote his name I noticed that his finger nails were clean, instead of being tipped with jet like that handsome little fellow's in the blue jacket. Don't you call these things letters of recommendation? I do, and I would give more for what I can tell about a boy by using my eyes ten minutes than all the letters of recommendation he can give me."

The Telephone in New York.

We are indebted to the *Western Electrician* for the interesting report under the above heading we recently gave, describing a visit of the members of the New York Electrical Society to the premises of the Metropolitan Telegraph and Telephone Company. Due credit should have been given at the time. The *Western Electrician* is one of the most enterprising and successful electrical publications in the world.

A PROSPEROUS German residing in America writes of a recent visit to his native country, thus: "One day I saw a review of cavalry in Berlin. There were thousands of men cantering gayly along for the entertainment of the young Emperor—the War Lord as he calls himself. The next day I went into the country, and not very far from the capital I saw a sight that was pitiful enough. One woman was holding a plow, and this was being dragged through the earth by two other women and a dog harnessed together. Here, then, were two pictures—the idle horses and the idle men capering about Berlin, the women and dogs doing the work of men and horses in the country!"

RECENTLY PATENTED INVENTIONS.

Mechanical Appliances.

METHOD OF KNITTING HOSE.—Frederick W. Simons, Philadelphia, Pa. This improvement provides for knitting simultaneously upon the halves of two leg portions a single web to form a heel on each leg, the heel parts being rounded on the outer side by throwing out of action certain of the needles, afterward bringing them successively into action again, and afterward severing the parts. The toe is also peculiarly formed, there being knit continuously upon the leg and heel portions a series of feet, the toe of one foot joining on to the rear end of the sole of the next foot, and being severed therefrom by cutting.

FLUE THIMBLE.—John P. Adams, Fargo, North Dakota. This thimble is preferably designed for engineers in charge of a boiler, to readily expand a leaking flue and hold the flue in expanded position until it is convenient to take the old flue out and insert a new one. It consists of a ring having one or more lengthwise splits, into which wedges may be driven to hold the ring in place in the flue, a conical and hollow mandrel being used in inserting and fixing the ring in place in the end of the flue.

WRENCH. — John Ryan, New York City. This is a simple, durable, and inexpensive tool, in which the handle is in two pieces and practically solid, the adjusting screw being given a support at the handle, which need not be recessed to receive the screw, thus adding materially to the strength of the entire wrench. The adjusting screw is so located that the front face of the body of the wrench need not be nicked in any manner, and may be made perfectly straight if desired.

ADJUSTABLE BRUSH HANDLE.—Charles F. Myers, McKinstry's Mills, Md. This is an improvement on a formerly patented invention of the same inventor, covering a novel construction and arrangement of parts for connecting the handle to the brush, to permit the inclination of the handle to the brush to be quickly changed at the will of the user, and be firmly held to its position when adjusted. There are positive locking clutches on a stationary plate through which passes a swiveling pin, an independent clutch fitting over the locking faces, a screw stem jointed to the swiveling pin, and a handle with a screw thimble adapted to force the clutch up to locking engagement.

Agricultural.

SEED PLANTER.—Anders Matson, Moline, Ill. This is a device for planting corn or other grain, dropping the grain at regular intervals and marking the places where the next row is to be dropped. This planter has an improved delivery or feeding wheel having a thin rim which rolls upon the ground, and whose hub portion is divided into two sections connected with which is a tapering feed-chute arranged in the place of a spoke, there being a valve at the mouth of the feed-chute connected with a rock shaft engaged by a cam. The invention includes various other novel features, and a covering shovel is secured to the frame to the rear of the delivery chute for the purpose of covering the grain that has been deposited.

CHURN.—James C. George, Coffeyville, Kansas. The churn body is preferably cylindrical, and within it wings are affixed to the side wall, radiating toward the axial center. Motion is given to the churn body by a crank mechanism, and by a rapid rotary movement the cream is thrown alternately in one direction against the wings and then in an opposite direction, quickly breaking up the butter globules and separating the butyric granules from the whey.

PLOW JOINTER.—Charles A. Stringer, Munnsville, N. Y. An adjusting disk has diametrical grooves in one face of different depths at its periphery, one groove crossing the other, the grooves being adapted to receive the plow standard, whereby a jointer may be given many positions and different inclinations. The jointer is an adjustable and reversible device, capable of being quickly and conveniently attached to any plow beam, whether of wood, iron or steel, and without disturbing the standard attached to the beam the jointer proper may be thrown to or from the land, simplifying the work of fitting all styles of plows. The jointer may be easily set and firmly held in place at an exact angle for sward or stubble, and the adjustments are effected with great simplicity.

CHERRY PICKER.—George Morris, Libertyville, Ill. This improvement consists in a pair of spring-pressed jaws pivoted in a ring and provided with knives for severing the cherry stems, there being rings for receiving the thumb and finger, and combined therewith is a sleeve of flexible material for receiving the cherries as they fall from the cutters and conducting them to a can or receptacle.

Miscellaneous.

TELEPHONOGRAPH. — James P. Magenis, North Adams, Mass. This is a combined microphone, telephone, and phonograph, by means of which, while telephoning to a distant station, a record of the words will be kept upon a phonograph cylinder at both ends of the line, a magnetic phonograph cylinder being provided by which the pressure of the stylus upon the record cylinder will be augmented by magnetic attraction instead of by gravity. Combined with a phonograph and diaphragm cell is a stylus-carrying lever with an armature and a magnetic photograph cylinder arranged to act upon the armature, while combined with the lever is an auxiliary armature arranged to be acted upon by a magnet, and a microphone connected with the mouth-piece of the phonograph and connected up in circuit with the distant stylus lever-operating electro-magnet, a telephonic magnet assisting the diaphragm in the production of the record.

CARTRIDGE LOADER. — William H. Hamner, Fort Assinaboine, Montana. This is a simple and durable device for accurately measuring the charge of powder and shot and delivering the desired wads in regular order of loading for each cartridge, and it is adapted to be worked with great ease by hand. Cylinders forming the cartridge holders of various diameters may be readily employed in the device, corresponding to the various diameters of shells to be loaded, the change being quickly made from one to another, and as many wads as desired may be rammed into the shell between the powder and shot and on top of the shot.

RAFTING LOGS. — Abram Van Kooy, Holland, Mich. This invention relates to improved means for connecting logs or timbers, and for towing them. For this purpose main tow lines and spacing blocks are employed, with connecting ropes applied to the tow lines and supplemental lateral tow chains, loosely connected with the main tow lines and having devices for attachment to the logs, there being also a series of devices for limiting the movement of the chains on the tow lines. It is designed by this improved means to so construct rafts that they can be towed with safety on the ocean or the great lakes, each log or timber being held separate and so that the waves cannot force them upon each other, the raft also offering the least possible resistance to the water.

POSTMARKING STAMP HOLDER.—Harrison T. Keith, Vincennes, Ind. Into a hollow longitudinally slitted handle extends a shank formed of a spiral spring, there being fixed to the outer end of the shank a socket for holding the stamp, the device constituting a convenient holder for supporting and manipulating the ordinary postmarking stamp used for canceling postage stamps and marking the mailing office on the envelope. The flexible shank permits the face of the stamp to adjust itself always flatly to the envelope to print evenly with all its letters, while the leverage may be changed to vary the action and relieve the monotony of the stroke, rendering the work less tiresome.

CHILD'S CHAIR. — Horace S. Carley, New York City. This is a light, durable, and sightly chair, having a swinging back which may be locked in different positions, a removable cushioned seat, and an adjustable tongue; it can be expeditiously and conveniently converted from an ordinary chair into a commode, or into a vehicle in which a child may be drawn from place to place.

METHOD OF DECORATING FABRICS.—Henry G. Bunch, New York City. A pattern plate with cut-out portion representing the design is first placed on the surface of the fabric and an adhesive substance applied through the openings in the plate to the exposed parts of the fabric, after which the pattern plate is removed and flocks are sprinkled on the fabric, the flocks being thus attached to the surface of wool, silk, or other material to form a fabric of highly ornamental appearance. The flocks, of wool, silk, or other material, are previously chopped or cut up to the proper condition for sprinkling, and the fabric may afterward be calendered or otherwise treated to press the flocks and cement tightly together on the body of the fabric.

HINGE FOR PAIL LIDS. — John W. Bowerbank, New York City. This invention provides a hinge more especially adapted for the lids of tin oyster pails, one that is cheap, durable, and inexpensive to manufacture, and will permit the lid to open for nearly the entire area of the pail top. It consists of a transverse wire rod secured in a fold along a straight edge of the lid in combination with two wire rod hook bars secured to the interior of the pail body and passed loosely through poles in the lid near its edge and near the ends of the transverse wire rod.

BICYCLE GEAR. — Frank R. Bigelow, Gloucester City, N. J. A differential gear is provided by this invention, comprising a rotatably supported sprocket wheel, a swinging drive shaft box within the wheel support, the driving shaft within the box having a pinion adapted to engage an internal gear of the sprocket wheel when the shaft box is swung. The improvement affords a convenient mechanism to quickly change the speed of the driving wheel and correspondingly alter the efficiency of applied power to propel the vehicle.

BOLT. — Antenor Assorati, New York City. This is a locking bolt for conveniently and firmly uniting two or more objects or parts of articles and effectually preventing them from having play in any direction. It consists of two clamping members having flat straight inner faces and heads formed at their ends upon their outer surfaces, and a locking or key section of the same thickness, with contractile and expansible sections and shoulders at both ends.

BOTTLE BASKET. — Charles A. Knight, Brooklyn, N. Y. This basket is more especially designed for carrying bottles containing milk, and has an adjustable handle, with supports of simple and inexpensive construction in the basket to act in conjunction with its sides and form independent compartments for the reception of bottles. The supports in the basket are so formed that the basket may be quickly and conveniently cleaned, and the main supports yield laterally to a limited extent under pressure; so that the bottles are not liable to breakage.

FENCE.—Julius Baker, Pittsburg, Pa. A metal fence which can be erected in an expeditious, convenient and economical manner is provided by this invention, the fence being light and durable, and the upper and lower rails being located at any desired angle to their supporting posts. Some of the pickets project far enough below the lower rail to enter the earth and assist in supporting the fence, and other intermediate pickets extend to the ground line.

AWNING WORKER. — John T. Baker, Chicago, Ill. The largest awnings over a door or window may be quickly and easily adjusted by the simple apparatus provided by this invention, which consists mainly of a spring roller to which and to the awning frame are secured ropes, there being a loosely mounted lever and mechanism between the lever and roller for operating the latter, with a locking device for the roller adapted to be released by the lever.

LATCH. — Aaron Richardson, Uniontown, and Frederick E. Richardson, Manchester, Iowa. This is a simple and durable latch, easily attached to all kinds of doors, and by which the door may be conveniently opened from one side, or locked in open or closed position. A spring-pressed bolt slides in the casing, a handle extending through guideways to one side of the door, and there are two fixed keepers held on the door casing, one adapted to be engaged by the bolt and the other by the handle.

DOOR HANGER.—Theodore C. Prouty and Claude W. Turner, Evanston, Ill. This device comprises a supporting bar on which a pair of outside arms is pivoted and connected pivotally by a cross arm, middle arms pivoted to the outside arms having two of their ends pivoted together, and a pendent rod being carried by the middle arms. The hanger may also be applied to any object besides a door which is to be held to reciprocate in a straight line, holding the door or object so that it cannot move except in the line of its reciprocation. It may be attached to the top, the bottom, or one edge of the door, and quickly and easily adjusted to level the door.

BLACKING STAND DEVICE. — Matilda A. Popoff, Brooklyn, N. Y. This is a receptacle or holder for liquid blacking, consisting of a box-like body provided with grooves one above the other in which may slide a lid or cover, the latter having an opening through which the neck of a bottle may extend. The receptacle is adapted to receive in locking engagement bottles of various heights, which may be conveniently removed and replaced as desired, the bottle being so held that the dauber may be removed from it with one hand.

STOP BLOCK FOR WAGONS. — John Pomroy, Lake Linden, Mich. A roller upon a spindle is, according to this improvement, held supported by chains in position to be readily placed behind a wagon wheel, or readily removed from such position and suspended from the axle. One of the chains is attached to the axle outside of the wheel, the other being attached to the wagon inside of the wheel, and the device is designed to be most useful when a wagon is ascending steep hills and it is desired to stop to rest the horses or for other purposes.

VEHICLE SPRING.—Thomas F. McKee, Bloomville, Ohio. This invention relates to springs for use on two-wheeled vehicles, and provides an attachment for connecting the front end of the vehicle body with the shafts, the attachment taking up the movements of the horse and running gear. The improvement comprises a fastening plate having a socket, a bolt extending through the socket and a ball working therein, a spring encircling the bolt, a second attaching plate through which the bolt passes and a second spring on the bolt between the second plate and a plate on the lower end of the bolt.

COMBINATION ICE PICK.—James F. Loftus and Eben B. Williams, Thorndike, Mass. This is a tool having a head with a handled socket on its upper side, a series of movable picks extending vertically through the head, upon which is mounted a movable plate having holes to register with the picks, the plates having also slots, and fastening bolts extending through the head and the slots in the plate. The tool may be quickly adjusted to break the ice into small pieces, split it or shave it, and will facilitate doing the work very rapidly.

SHUTTER WORKER.—Sarah M. Fisher, Spencer, N. Y. This is a device of simple and economic construction capable of being manipulated from the inside of a room to open or close the blinds, or to hold the blinds locked either in an open or closed position. A sliding and rotating draw rod extending through the window frame outwardly is coupled to a connecting rod, the latter being connected with a block sliding in a bracket attached to the blind, one of the devices being employed in connection with each blind.

WATER SUPPLY SYSTEM.—James W. Fisher, Palouse, Washington. This invention relates to systems in which the water is drawn from the fountain head and supplied to a reservoir through a siphon pipe, and provides a convenient means of closing either or both ends of the siphon pipe, and of filling the pipe. There is a swinging cap on one end of the pipe, with which is connected a lever for opening and closing the cap, there being a pivoted cap on the other end of the pipe and a screw connected therewith for opening and closing it.

POCKET LAMP.—Jacob H. Fawkes, New York City. This device consists of two nearly parallel cylinders, one of which contains lighting caps and the other oil and a wick. By pulling the cylinders apart one of the caps is ignited and lights the wick, which will burn until the cover is put on or the oil exhausted. The lamp may be conveniently carried in the pocket, and may be lighted a great many times without reloading.

ELEVATED CARRIER.—James J. Robinson, River View, West Virginia. This improvement is designed to facilitate logging and the conveying of heavy bodies from point to point at an elevation from the ground. The track may be quickly and inexpensively erected upon ground of any character and the carriage is provided with a brake and mechanism whereby the load may be lifted bodily from the ground and carried as high up as desired with a minimum of labor.

WICK TRIMMER.—Daniel L. Andrews, Denison, Texas. A pair of blades is pivoted upon a flat plate having a guide slot to receive the wick, the cutting edges registering with the slot to cut off the wick that projects through, there being a depending guide tube on each limb of the guide plate. The blades shear the wick from each side edge toward the center simultaneously, and the guides afford means to retain the implement in correct position for use on lamp wick tubes of different sizes.

COCK OR TAP.—Ulysse André and Olivier Durand, Barcelona, Spain. A plate is connected with a nut screwed to the cock casing to encircle the plug, a nut being also secured to the plug stem and springs encircling the plug stem between its nut and the casing and between its nut and the plate. The improvement is designed to obviate the gripping of the plug from its entering too far into the casing, the extent of entry of the plug being maintained constant by the use of springs.

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SCIENTIFIC AMERICAN

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JUNE NUMBER.—(No. 80.)

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2. Plate in colors of a cottage erected at Bensonhurst, Long Island, N. Y. Perspective elevations and floor plans. Cost $3,450 complete. P. F. Higgs, architect, New York.
3. Engravings and floor plans of the Crescent Block of six houses erected on Golden Hill, at Bridgeport, Conn. An excellent design. Total cost of six houses $55,000 complete. Messrs. Longstaff & Hurd, architects, Bridgeport, Conn.
4. A handsome residence at Babylon, Long Island, N. Y., recently erected for F. H. Kalbfleisch, Esq. Cost $17,500 complete. Two perspective views and floor plans. H. J. Hardenberg, New York, architect.
5. A school house at Upper Montclair, N. J. Perspective view and ground plans. Cost $12,200 complete, including heating and ventilating apparatus. Geo. W. Da Cunha, architect, New York.
6. Perspective views of several very attractive dwellings located near New York.
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11. Proposed railway tower for the Columbian Exposition at Chicago.
12. Sketch of the new City Hall, Philadelphia.—A magnificent structure.
13. Miscellaneous contents: Cork pavement.—Best treatment of hardwood floors.—The twin staircase, illustrated.—The electric stair climber, illustrated.—The sick room temperature.—Stair builder's goods, illustrated.—Ornamental hardwood floors.—Large winding partition doors.—The "Alberene" laundry tub.—House heating and ventilation.—Nolan's hot water and steam heater, illustrated.—The crushing resistance of bricks.—An excellent motor, illustrated.—A successful hot water heater, illustrated.—The lacquer tree.—A self-retaining dumb waiter, illustrated.—Architectural wood turning, illustrated.

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Minerals sent for examination should be distinctly marked or labeled.

(4415) S. D. C. asks: The cheapest and best power (steam or electric) to run a woodworking plant, which requires 40 h. p. to operate it. Our electric plant has plenty of extra power, and they have offered to furnish us electric power for $5 per h. p. per month. Would it be necessary to have a motor for each machine? Please state difference of cost between the two powers. A. Steam is the cheapest for 40 horse power with a good type of engine and boiler. You can run on from 1,700 to 2,000 lb. of coal per day, or say an average of 22 tons per month, which at $3 per ton is $66, and wages of an engineer $60 per month. Oil waste and sundries $5 per month, total $131. Electric power $5 by $40 = $200. One electric motor only, is needed, with part of the time of a man to look after it with oil and sundries will bring the cost to about $225 per month. Whatever difference there is in your place for coal other than as above, you can make allowance for.

(4416) G. C. F. says: Please give me a formula for making a neutral or alkaline copper bath suitable for copper-plating zinc by the galvanic process. A. The best alkaline copper solution is that introduced by Mr. A. Watt, and subsequently modified by Mr. J. T. Sprague. Dissolve 8 ounces of copper sulphate in 1 quart hot rain water and set aside to cool. When cool, add liquid ammonia while stirring with a stick or glass rod. At first a green precipitate will fall, and then this will dissolve on adding more ammonia, until the whole solution assumes a lovely blue tint. Dilute this with an equal bulk of cold rain water, and add to it enough solution of potassium cyanide, while stirring, to destroy the fine blue color of the ammonia sulphate and give the color of old ale to the solution. Set this aside for a few hours, then pass it through a calico filter and make it up to a gallon of solution with rain water. This solution may be worked cold, but the rate of deposition is increased and the deposited copper of improved quality when the solution is heated to a temperature of from 110° to 130° Fah.

(4417) S. McI. writes: Glass and sealing wax, if rubbed on cloth, will attract light substances. Is there any way of making a magnet permanent to attract small bits of paper, or other light substances, as an ordinary horse shoe magnet attracts steel? A. Magnets will attract only magnetic materials and conductors carrying electric currents.

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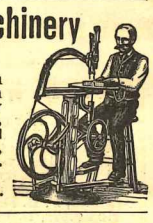
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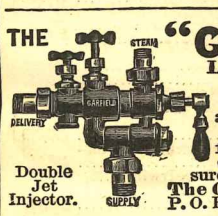
THE  **"GARFIELD"**
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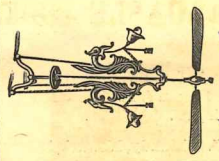
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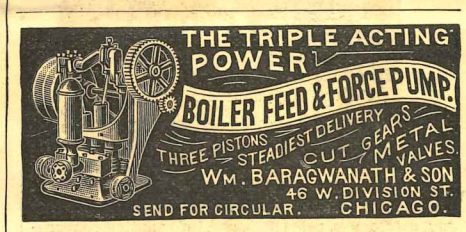

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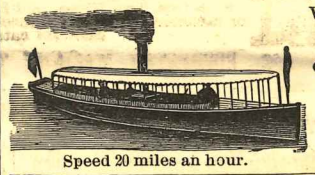
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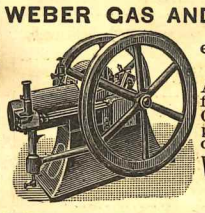
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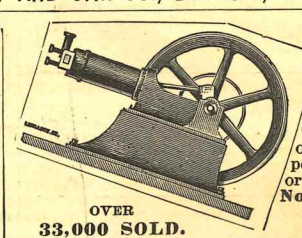
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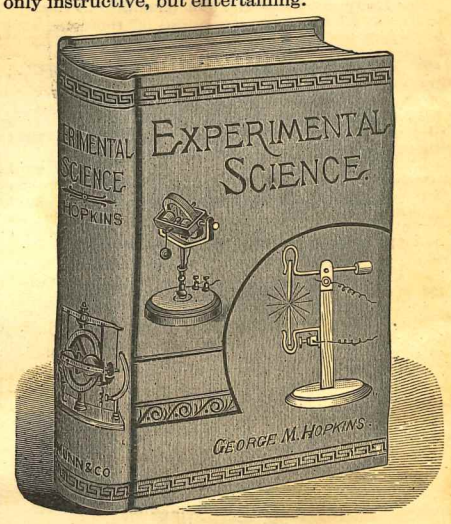

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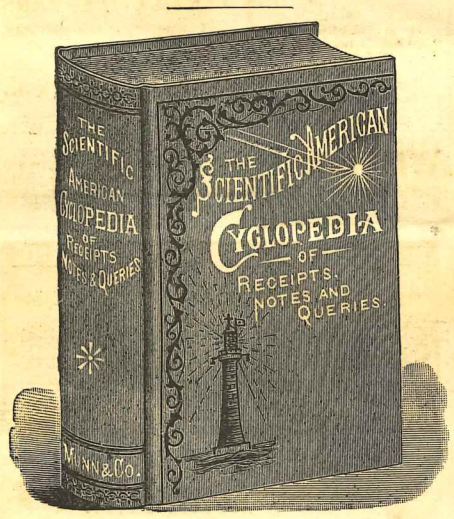

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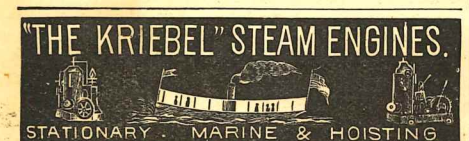

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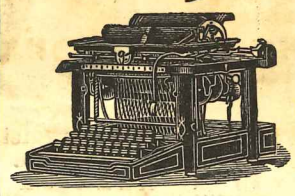

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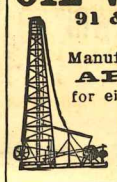

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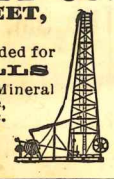

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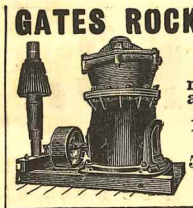

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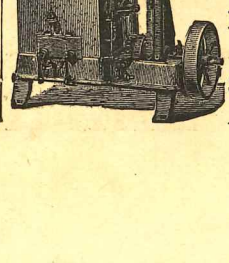

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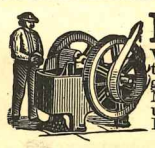

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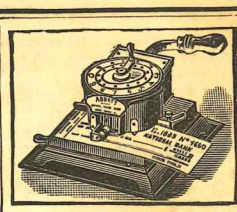

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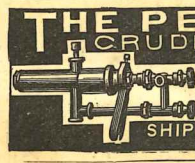

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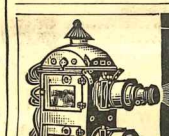

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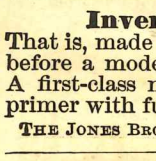

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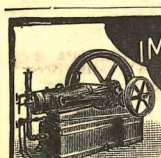

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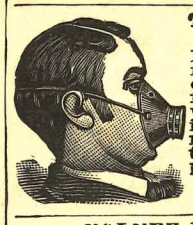

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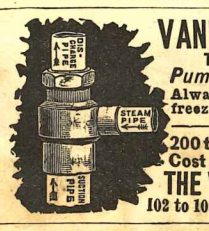

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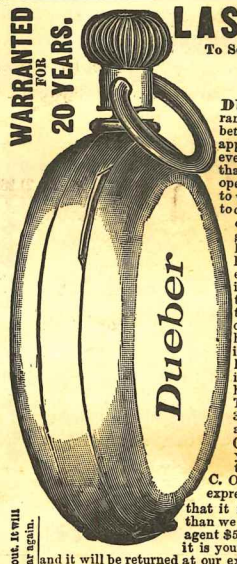

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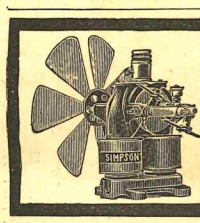

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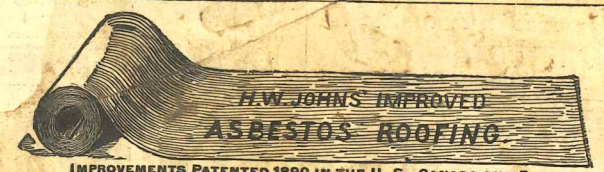

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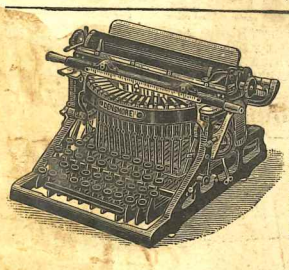

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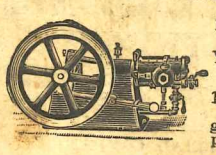

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